

# **EXHIBIT 27-1**

July 14, 2017

Mr. John Niland  
Director, Business Development  
Invenergy  
One South Wacker Drive  
Suite 1800  
Chicago, Illinois 60606

Subject: Invenergy Clear River Energy Center  
Exponent Project No. 1608155.000

Dear Mr. Niland:

This letter report summarizes the Exponent analysis performed to assist Invenergy in response to a data request from the Town of Burrillville (RI) regarding potential impact areas associated with potential vapor cloud explosions at the Invenergy Clear River Energy Center facility (hereafter indicated as CREC) resulting from a release of flammable gases. The analysis presented here is supplemental to Exponent's report issued October 27, 2016, in support of the CREC. The October 27, 2016, report contains a summary of Exponent's qualifications.

Exponent's analysis relied upon information regarding the proposed facility supplied by Invenergy. Based on the data request from the Town of Burrillville and on the material inventory present at the Invenergy Clear River Energy Center facility (information supplied to Exponent), a number of hypothetical release scenarios were considered and analyzed for potential overpressure from a vapor cloud explosion (see list below). These accidental release scenarios resulting in a vapor cloud explosion have a probability of occurrence ranging between  $10^{-5}$  to  $10^{-10}$ /yr, or once every 100,000 years to 10 billion years.

- (1) a combined release of the hydrogen and natural gas inventories discussed in Exponent's October 27, 2016 report,
- (2) a release of hydrogen from a hydrogen tube trailer,
- (3) a release of natural gas from the natural gas pipeline,
- (4) a combined release of hydrogen from a hydrogen tube trailer and natural gas from the proposed plant.

In addition, a fifth scenario was considered, which involves a probability of occurrence lower than once every 10 billion years:

- (5) a combined release of natural gas and hydrogen from both the CREC facility and the Algonquin/Spectra compressor station.

As requested by CREC, Exponent performed overpressure calculations for the first four scenarios using PHAST, a consequence analysis tool developed for the evaluation of hazardous consequences (including vapor dispersion, thermal radiation, and explosion overpressure). PHAST is widely used in industry, has been validated and approved as a tool of choice by numerous US regulatory agencies including the US DOT.

The PHAST model used for the overpressure analysis incorporates the Baker-Strehlow-Tang (BST) vapor cloud explosion model for calculating the effects of the ignition of flammable vapor clouds, consistent with Exponent's October 27, 2016, report. The calculation of vapor cloud explosion effects using the BST method requires several input parameters from the user, such as: flammable mass, gas mixture reactivity, obstacle density, flame expansion factor, and ground reflection factor. The obstacle density, flame expansion factor, and ground reflection factor are used in the model to approximate the effects of confinement and congestion on the vapor cloud explosion. The BST model calculates the blast wave pressure versus distance for a vapor cloud explosion given these parameters. Furthermore, while the PHAST model assumes flat and unobstructed ground, it is expected that large obstruction (*e.g.* buildings) located along the direction of the pressure wave propagation may provide some degree of shielding to areas located behind them.

The PHAST model assumes that the maximum available amount of fuel gas is released instantaneously and is present in a highly congested volume. These conservative assumptions are intended to provide an upper bound to the consequences of potential accidental releases at the facility, as requested in the Town's questions.

In order to estimate the gas reactivity associated with the hydrogen-natural gas mixtures required for the evaluation of combined release scenarios (*i.e.* scenarios 1 and 4), Exponent relied upon DARS, a comprehensive toolkit used for the evaluation of complex chemical reactions. In particular, Exponent used this software to estimate (1) the laminar burning velocity for the range of hydrogen-natural gas mixtures associated with combined release scenarios and (2) the corresponding gas mixture reactivity. The latter values were then used as input for the PHAST overpressure calculations.

The blast radius associated with the overpressure events identified in the Town's request is estimated by evaluating the distance to an overpressure endpoint of 1 pound per square inch (psi) resulting from a vapor cloud explosion of a cloud containing the largest quantity of the regulated flammable substance from a vessel or process pipe line failure.<sup>1</sup> At 1 psig pressure, the

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<sup>1</sup> General Guidance on Risk Management Programs for Chemical Accident Prevention (40 CFR Part 68), EPA 555-B-04-001, United States Environmental Protection Agency, p. 4-4, March 2009.

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blast wave is expected to shatter glass windows. Much higher pressures are necessary to damage the equipment at the compressor station.

The following sections of this letter report contain (1) the Town of Burrillville (RI) data request questions and (2) the corresponding responses drafted by Exponent. Relevant standards and model input conditions are also described in the responses.

**Question 1:** *What is the blast radius if hydrogen gas and natural gas from the proposed plant exploded?*

**Response to 1:**

Exponent understands that the Town of Burrillville requests the evaluation of a scenario involving a simultaneous release of hydrogen and natural gas followed by a single overpressure event where hydrogen and natural gas are combusted. The probability of having a simultaneous release of hydrogen and natural followed by an explosion can be calculated as the product of the probabilities of occurrence for each release, times the probability for a damaging explosion to occur.

As discussed in Exponent's October 27, 2016 report, the probability of having an accidental release from gas piping or process equipment that could lead to a catastrophic explosion is on the order of  $10^{-4}$ /yr, or once every 10,000 years. Furthermore, the probability of an explosion is most often found to be 1-2 orders of magnitude lower than the probability of the accidental release occurring.<sup>2</sup> Thus, the likelihood of CREC facility suffering a catastrophic gas explosion involving an accidental and simultaneous release of hydrogen and natural gas is anticipated to be on the order of  $10^{-9}$  to  $10^{-10}$ /yr, or once every 1 billion to 10 billion years.

The overpressure calculations assumed that all of the hydrogen for one unit (approximately 22,000 scf as reported in Exponent's October 27, 2016, report) contributed to the explosion.<sup>3</sup> It was also assumed that the hydrogen was mixed with natural gas in proportions that would yield either a high or medium reactivity fuel mixture, as defined for the BST method.<sup>4</sup> It is expected hydrogen and natural gas mixtures resulting in low reactivity fuel (i.e. natural gas content higher than 80% by volume) will be bounded by the natural gas overpressure calculation provided in Exponent's October 27, 2016, report and described again in Response 3 of this report.

A total of three scenarios were considered in order to bound the overpressure effects from a concurrent release of hydrogen process gas and natural gas resulting in a high or medium reactivity fuel mixture:

- **Scenario 1a** – the entire contents of the hydrogen process gas contributing to the overpressure event, with no natural gas.
- **Scenario 1b** – the entire contents of hydrogen process gas plus enough natural gas to produce a mixture defined as a high reactive fuel in the BST method.

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<sup>2</sup> See for example, "Publication Series on Dangerous Substances (PGS 3), Guidelines for quantitative risk assessment" (The Purple Book), or MPACT Theory (December 2010) for DNV's PHAST Risk software.

<sup>3</sup> One generator contains approximately 20,300 standard cubic feet (scf) of hydrogen gas and is connected to a storage system with a capacity of approximately 1,600 scf of hydrogen gas.

<sup>4</sup> Based on guidance provided in Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE and Flash Fire Hazards, 2<sup>nd</sup> ed. CCPS (2010) – high reactive fuels correspond to laminar burning velocities about 75 cm/s and low reactive fuels correspond to laminar burning velocities less than 45 cm/s. For laminar burning velocities from 45-75 cm/s, medium reactivity is typically assigned.

- **Scenario 1c** – the entire contents of hydrogen process gas plus enough natural gas to produce a mixture defined as a medium reactive fuel in the BST method.

For the purposes of these calculations, the natural gas was assumed to be pure methane. The DARS software was used to calculate the ratio of hydrogen and methane resulting in laminar burning velocities of 75 cm/s and 45 cm/s, corresponding to hydrogen-methane mixtures with a BST reactivity of high and medium, respectively. A summary of the results is provided in Table 1.

Table 1. Summary of the BST fuel reactivity calculations for bounding hydrogen-methane mixtures involving a concurrent release of hydrogen process gas and natural gas at the proposed plant.<sup>5</sup>

Scenario	Hydrogen mol%	Methane mol%	Hydrogen Volume (scf)	Methane Volume (scf)	BST Fuel Reactivity
1a	100	0	22,000	0	High
1b	58	42	22,000	15,900	High
1c	20	80	22,000	88,000	Medium

The pure hydrogen scenario (1a) was calculated and reported in Exponent’s October 27, 2016, report but is included here for comparison. Conservative BST model parameters were applied in the calculation: high obstacle density (which provides the highest flame speeds) and a ground reflection factor of 2 (which results in the highest calculated blast wave pressure). The flame was assumed to expand in all three dimensions. The results from the BST overpressure calculations are summarized:

- **Scenario 1a** – 717 feet to 1 psig
- **Scenario 1b** – 1,080 feet to 1 psig
- **Scenario 1c** – 878 feet to 1 psig

The calculated 1 psig overpressure contours (centered around the unit buildings) are presented as contours on the plot plan in Figure 1.

It should be noted that conservative assumptions were made in developing these calculations. For instance, it is unlikely that the entire hydrogen inventory from one unit will contribute to a vapor cloud explosion for multiple reasons. For example, the gas has a low ignition energy thus is likely to be ignited early in a release, and a delayed ignition is not likely. Likewise, it is not

<sup>5</sup> Note that for scenarios 1a through 1c, it is assumed that the hydrogen leak occurs inside the building where it mixes with natural gas.

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likely that a mixture of hydrogen and natural will mix in the exact ideal concentrations as detailed above.

# Basis = 22,000 scf Hydrogen

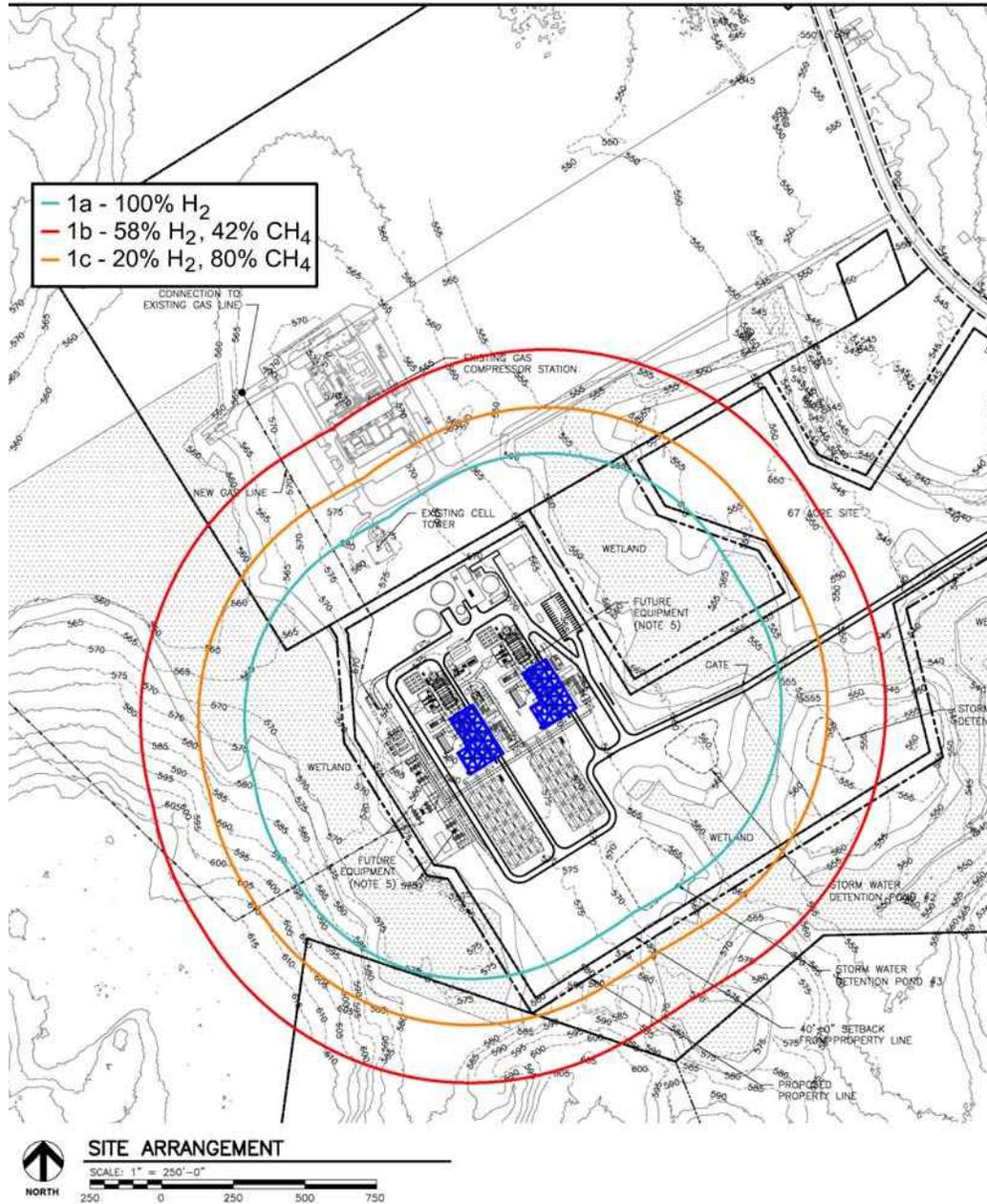


Figure 1. Plot plan showing the calculated 1 psi overpressure contours for releases involving the hydrogen process gas and mixtures involving the hydrogen process gas and natural gas.

**Question 2:** *What would be the blast radius of the total volume of hydrogen stored in a hydrogen tube trailer?*

**Response to 2:**

Exponent assumed that a hydrogen tube trailer contains approximately 50,000 standard cubic feet (scf) of hydrogen gas. For the present explosion calculation, it was conservatively assumed that all of the hydrogen for one trailer (approximately 50,000 scf) contributed to the explosion. Conservative BST model parameters were also applied in the calculation: high obstacle density (which provides the highest flame speeds) and a ground reflection factor of 2 (which results in the highest calculated blast wave pressure). The flame was assumed to expand in all three dimensions. The calculated distance to the 1 psig pressure threshold for this scenario, using the BST method, was found to be 943 feet. The calculated 1 psig overpressure contour (centered around the hydrogen tube trailer parking areas) is presented as contours on the plot plan in Figure 2.

Note that two hydrogen tube trailers may be present on site serving the two CREC unit's buildings. The blast radius associated with the hydrogen release from one tube trailer may affect the second tube trailer causing an additional hydrogen leak. In case of ignition, the blast associated this leak has the same distance to the 1 psig overpressure threshold and will be centered around the second tube trailer parking areas as shown in Figure 2.



**Question 3:** *What would be the blast radius of a pipeline explosion?*

**Response to 3:**

An expected worst-case natural gas overpressure event was evaluated in Exponent's October 27, 2016, report. As discussed in the previous report, natural gas is a low reactivity fuel which requires either a high degree of congestion or confinement in order to cause damaging overpressure if it is ignited. Therefore, a methane leak from a pipeline in a non-congested or non-confined area would not result in a blast but in a flash fire with no appreciable overpressure generated in case of ignition. An overpressure event can be generated in the rare case where a methane leak would produce a cloud that drifts due to atmospheric conditions into a congested/confined area.

In the prior analysis, it was conservatively assumed that a stoichiometric mixture of air and natural gas leaking from a pipeline would fill the entire volume of a unit's building (approximately 1,250,000 ft<sup>3</sup>). Because the maximum congested cloud volume remains unchanged, an increase in the natural gas release volume would not change the worst-case overpressure consequence. Therefore, the pipeline release scenario is bounded by the natural gas explosion consequence reported in Exponent's October 27, 2016, report. In the original overpressure analysis, it was conservatively assumed that the power plant building was characterized by high obstacle density.<sup>6</sup> Conservative BST model parameters were also applied in the calculation: high obstacle density (which provides the highest flame speeds) and a ground reflection factor of 2 (which results in the highest calculated blast wave pressure). The flame was assumed to expand in all three dimensions. The calculated distance to the 1 psig pressure threshold for this scenario, using the BST method, was found to be 884 feet (as presented in the October 27, 2016, report).

It should be noted that the pipeline overpressure scenario is expected to represent an upper bound for overpressure events involving natural gas leaks at the Algonquin/Spectra compressor station. In particular, the size of Algonquin/Spectra compressor buildings is significantly smaller than the unit's building at CREC site. As a result, the mass of natural gas that can be located in a confined/congested area at the compressor station will be lower than what was estimated for the CREC site resulting in (1) smaller overpressure, and (2) distance to the 1 psig pressure threshold smaller than 884 feet.<sup>7</sup>

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<sup>6</sup> Note that, given the type of construction, it is assumed that the building confinement does not contribute significantly to the overpressure event. These types of building are known to fail at overpressure around 1psig.

<sup>7</sup> Note that Exponent assumed that the Algonquin/Spectra buildings have similar construction characteristics as the CREC unit's buildings and, as such, they would fail at pressures around 1 psig.

**Question 4:** *What would be the blast radius of (a) & (b) together?*

**Response to 4:**

In this question, Exponent understands that the Town of Burrillville (RI) requests an estimate of the overpressure event associated with a combined release of hydrogen from the tube trailer (see Response 2) and natural gas from the pipeline (see Response 3). A similar methodology as described in Response 1 is used here to estimate the effects of a concurrent hydrogen tube trailer and natural gas overpressure event.

The overpressure calculations assumed that all of the hydrogen for one hydrogen tube trailer (approximately 50,000 scf) contributed to the explosion. It was also assumed that the hydrogen was mixed with natural gas in proportions that would yield either a high or medium reactivity fuel mixture, as defined for the BST method.<sup>8</sup> As explained earlier, it is expected that hydrogen and natural gas mixtures resulting in low reactivity fuel mixtures will be bounded by the natural gas overpressure calculation provided in Exponent's October 27, 2016, report and described again in Response 3.

A total of three scenarios were considered in order to bound the overpressure effects from a concurrent release of hydrogen from a tube trailer and natural gas:

- **Scenario 2a** – the entire contents of the hydrogen in the tube trailer contributing to the overpressure event, with no natural gas. This is identical to the scenario described in Response 2.
- **Scenario 2b** – the entire contents of hydrogen in the tube trailer plus enough natural gas to produce a mixture defined as a high reactive fuel in the BST method.
- **Scenario 2c** – the entire contents of hydrogen in the tube trailer plus enough natural gas to produce a mixture defined as a medium reactive fuel in the BST method.

For the purposes of these calculations, the natural gas was assumed to be pure methane. The DARS software was used to calculate the ratio of hydrogen and methane resulting in laminar burning velocities of 75 cm/s and 45 cm/s, corresponding to hydrogen-methane mixtures with a BST reactivity of high and medium, respectively. A summary of the results is provided in Table 2.

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<sup>8</sup> Based on guidance provided in Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE and Flash Fire Hazards, 2<sup>nd</sup> ed. CCPS (2010) – high reactive fuels correspond to laminar burning velocities about 75 cm/s and low reactive fuels correspond to laminar burning velocities less than 45 cm/s. For laminar burning velocities from 45-75 cm/s, medium reactivity is typically assigned.

Table 2. Summary of the BST fuel reactivity calculations for bounding hydrogen-methane mixtures involving a concurrent release of hydrogen from a tube trailer and natural gas.<sup>9</sup>

Scenario	Hydrogen mol%	Methane mol%	Hydrogen Volume (scf)	Methane Volume (scf)	BST Fuel Reactivity
2a	100	0	50,000	0	High
2b	58	42	50,000	36,200	High
2c	20	80	50,000	200,000	Medium

The pure hydrogen scenario (2a) was calculated and reported in Response 2 but is included here for comparison. Conservative BST model parameters were applied in the calculation: high obstacle density (which provides the highest flame speeds) and a ground reflection factor of 2 (which results in the highest calculated blast wave pressure). The flame was assumed to expand in all three dimensions. The results from the BST overpressure calculations are summarized:

- **Scenario 2a** – 943 feet to 1 psig
- **Scenario 2b** – 1,420 feet to 1 psig
- **Scenario 2c** – 1,150 feet to 1 psig

The calculated 1 psig overpressure contours (centered around the unit buildings) are presented as contours on the plot plan in Figure 3.

It should be noted that conservative assumptions were made in developing these calculations. For instance, it is unlikely that the entire hydrogen inventory from a hydrogen tube trailer will contribute to a vapor cloud explosion for multiple reasons. For example, the gas has a low ignition energy thus is likely to be ignited early in a release. Likewise, it is not likely that a mixture of hydrogen and natural will mix in the exact ideal concentrations as detailed above.

<sup>9</sup> Note that for scenarios 2a through 2c, it is assumed that the hydrogen leak occurs inside the building where it mixes with natural gas.

# Basis = 50,000 scf Hydrogen

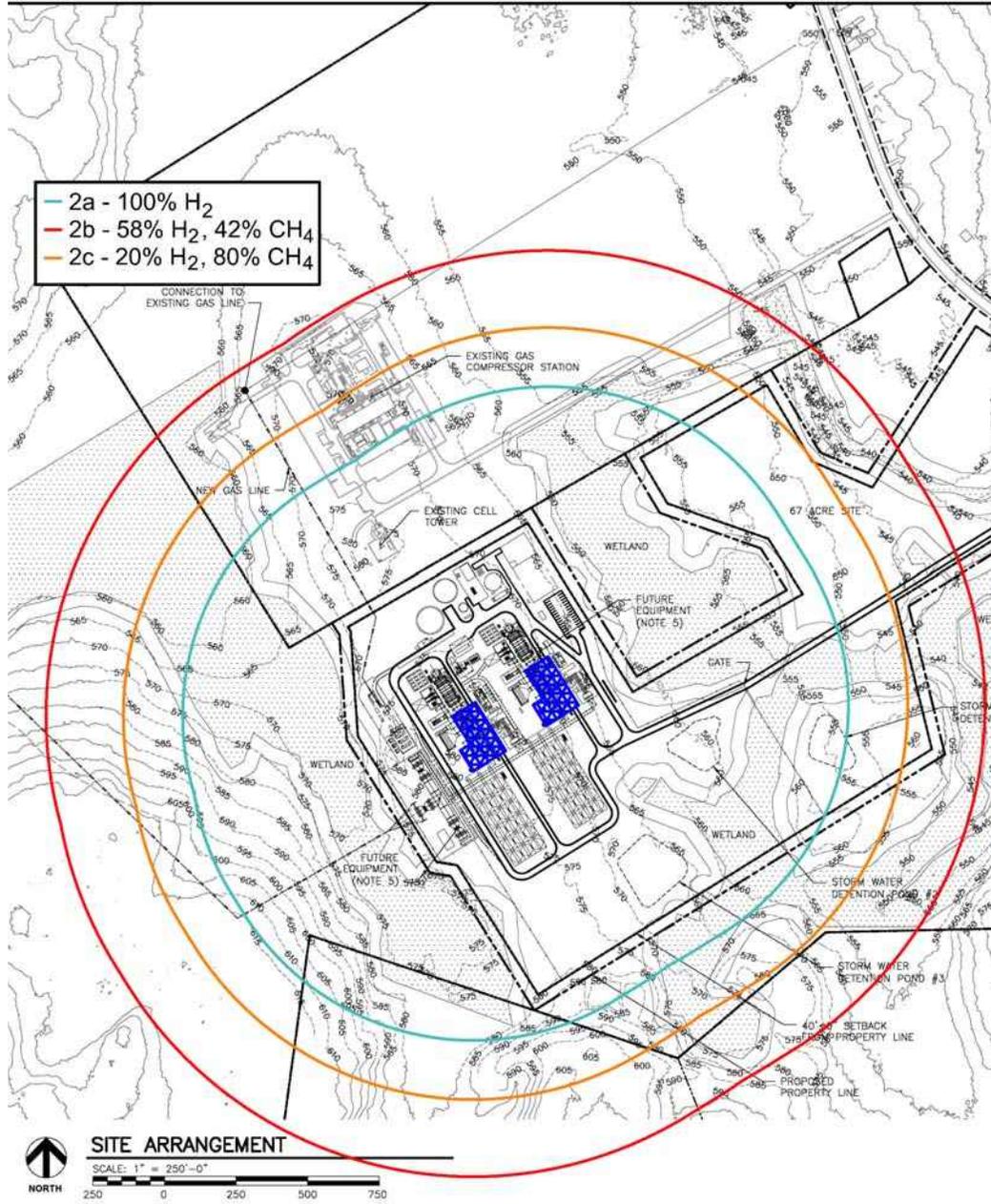


Figure 3. Plot plan showing the calculated 1 psi overpressure contours for releases involving the hydrogen tube trailer and mixtures involving the hydrogen tube trailer and natural gas.

**Question 5:** *What is the blast radius if hydrogen gas and natural gas from the proposed project and Algonquin /Spectra compressor station exploded?*

The blast radius associated with the combined release of hydrogen gas and natural gas from both the CREC facility and the Algonquin /Spectra compressor station was not evaluated. This scenario could not be studied since there is insufficient information regarding the gas inventory present at the Algonquin /Spectra compressor station. However, it should be noted that this hypothetical simultaneous release scenario resulting in a vapor cloud explosion has a probability of occurrence that is orders of magnitude lower than of once every 10 billion years. In addition, since the equipment at the two facilities are more than 750 feet apart, the flammable releases of hydrogen and natural gas generated at each facility would need to be transported by the atmospheric wind and mix together within a congested area while they are still in the flammable range. This would further lower the likelihood of a catastrophic gas explosion involving accidental and simultaneous releases at both facilities.

## Limitations

The study presented in this letter report is intended for use by Invenergy in relation to the Town of Burrillville (RI) data requests regarding potential impact areas associated with overpressure events at the Invenergy Clear River Energy Center facility. Proper application of this report requires recognition and understanding of the limitations of both the scope and methodology of the study.

The scope of the study was to answer specific questions in the Town data request, more specifically to estimate overpressure distances resulting from the ignition of hydrogen and natural gas vapor clouds. Model calculations were performed consistent with guidance in 40 CFR 68 and the ALOHA technical manual and engineering and process specifications provided by Invenergy. The scope of this analysis was strictly limited to analyzing the hypothetical hydrogen and natural gas overpressure scenarios as requested by Invenergy in relation to the Town data request responses. Exponent did not participate in any hazard or risk analyses, design reviews, or onsite inspections related to the proposed or existing facilities.

The methodology forming the basis of the results presented in this report is based on mathematical and statistical modeling of physical systems and processes as well as data from third parties. Given the nature of these evaluations, significant uncertainties are associated with the various hazard and loss computations, some of which are accounted for in the methodology, while other uncertainties such as for example, as-built construction details, modifications, current conditions, material characteristics, among others cannot be readily incorporated into the analyses. These uncertainties are inherent in the methodology and subsequently in the generated hazard and loss results. These results are not facts or predictions of the loss that may occur as a result of future events or any specific event; as such, the actual losses at a given risk factor relevant to this study may be materially different from those presented in this study. Furthermore, the assumptions adopted in determining these loss estimates do not constitute the exclusive set of reasonable assumptions, and use of a different set of assumptions or methodology could produce materially different results. The scope of this report is narrowly

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defined, and any re-use of this report or its findings, conclusions, or recommendations presented herein are at the sole risk of the user.

If you have any questions or require additional information, please do not hesitate to contact me at (508) 652-8519 or [hkyltomaa@exponent.com](mailto:hkyltomaa@exponent.com).

Harri Kytomaa, Ph.D.  
Principal Engineer & Group Vice President

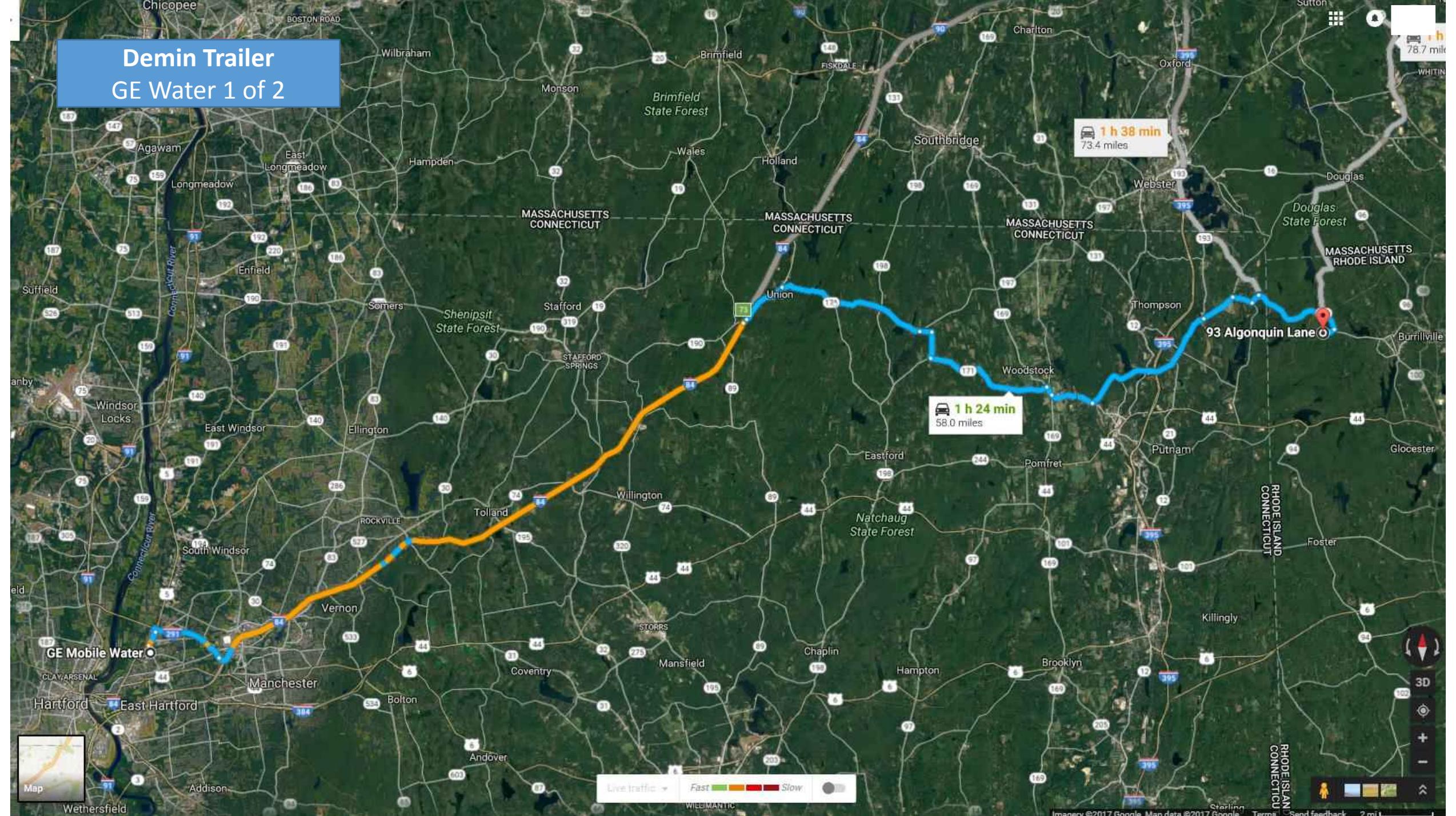
Ryan Hart, Ph.D.  
Managing Engineer

Alfonso Ibarreta, Ph.D.  
Managing Engineer

Francesco Colella, Ph.D.  
Manager

# **EXHIBIT 27-7**

# Demin Trailer GE Water 1 of 2



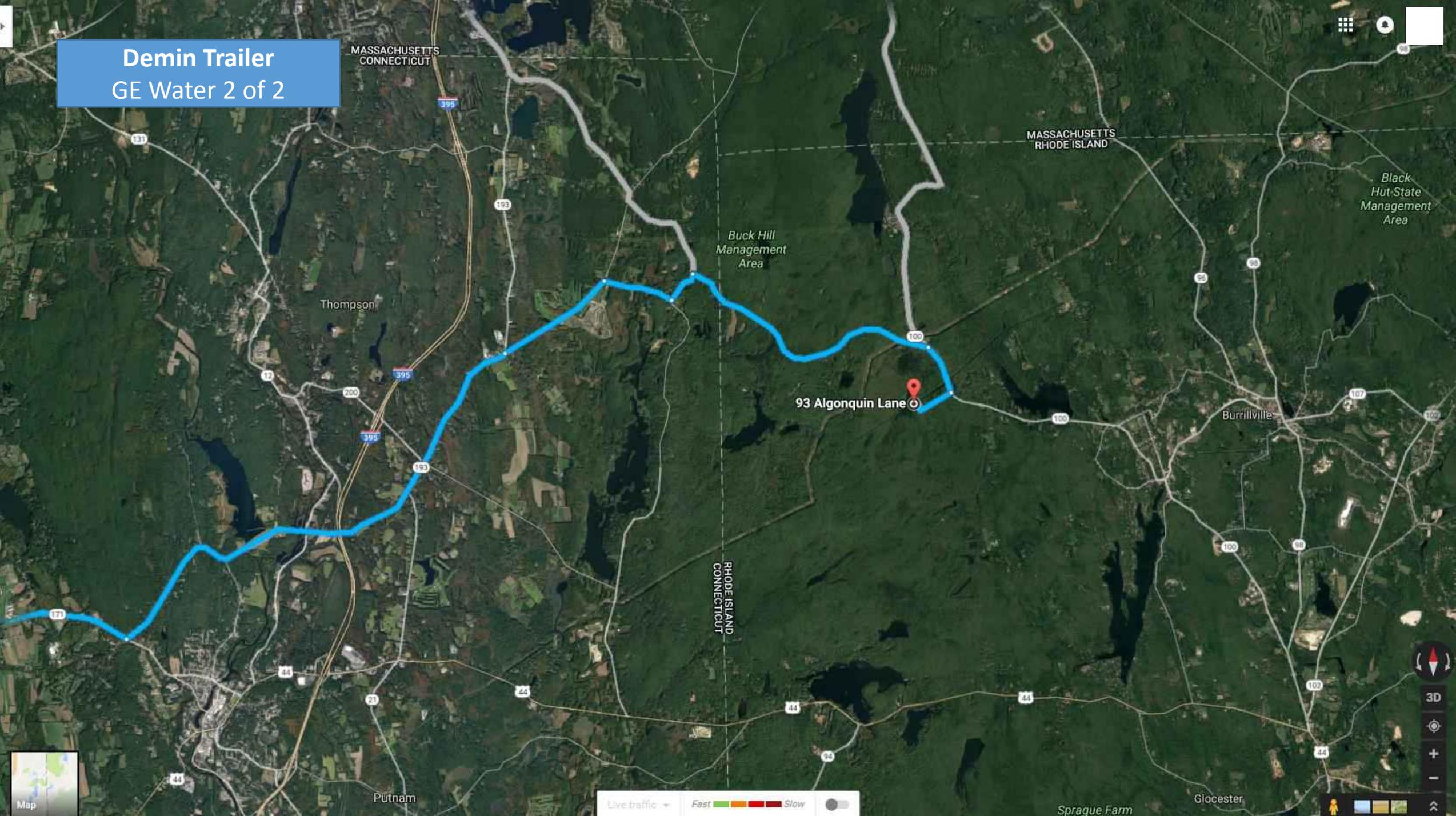
Live traffic  Fast  Slow



3D   
Map   
+   
-   
2 mi

# Demin Trailer

## GE Water 2 of 2



MASSACHUSETTS  
CONNECTICUT

MASSACHUSETTS  
RHODE ISLAND

Black  
Hut State  
Management  
Area

Buck Hill  
Management  
Area

Thompson

93 Algonquin Lane

Burrillville

RHODE ISLAND  
CONNECTICUT

Putnam

Sprague Farm

Gloicester

Live traffic  Fast  Slow

3D

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↑

Map

**Demin Trailer**  
Evoqua 1 of 2

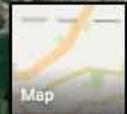
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74.0 miles

1 h 15 min  
58.5 miles

1 h 17 min  
56.3 miles

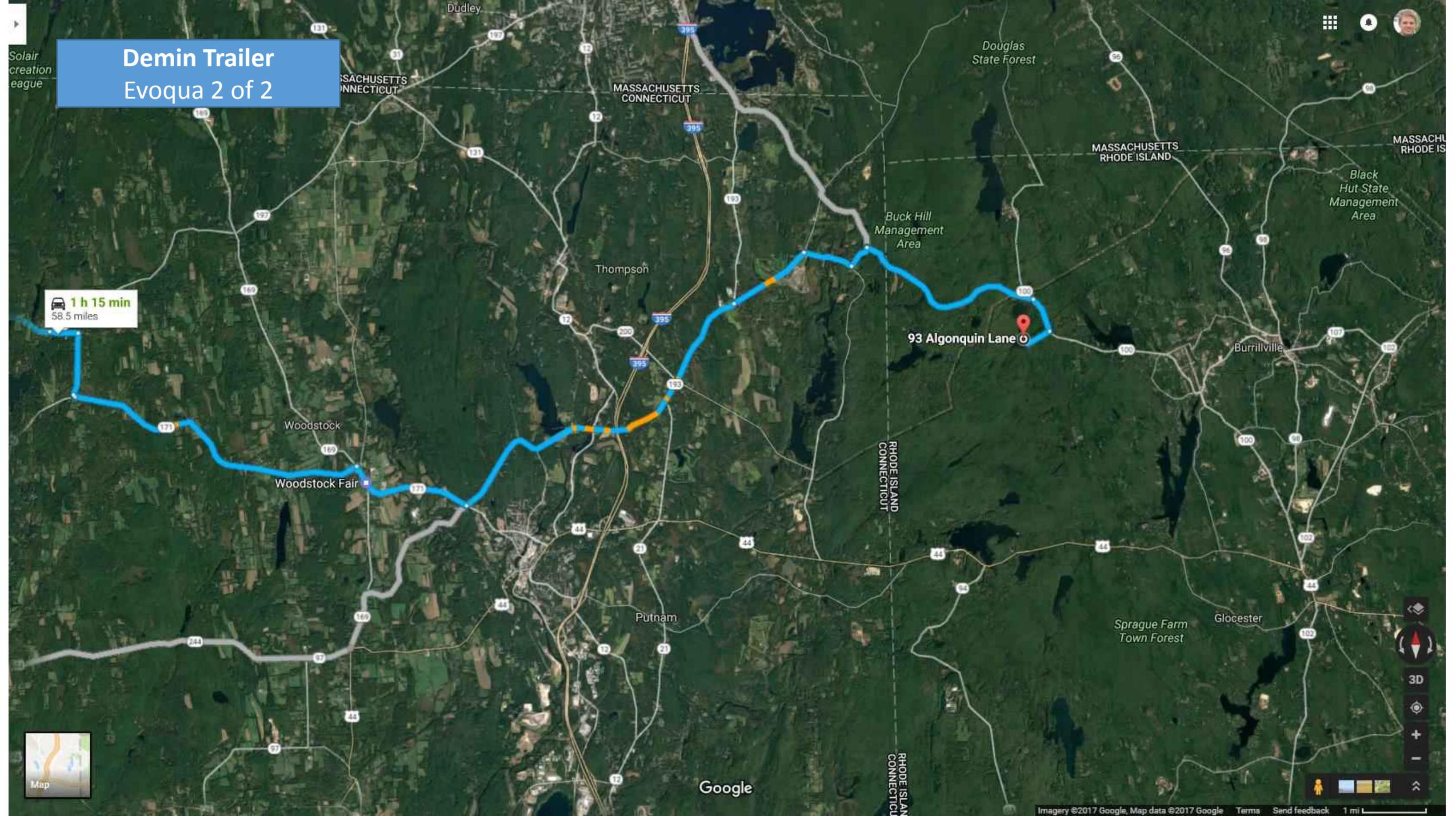
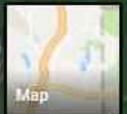
88 Nutmeg Road South

93 Algonquin Lane



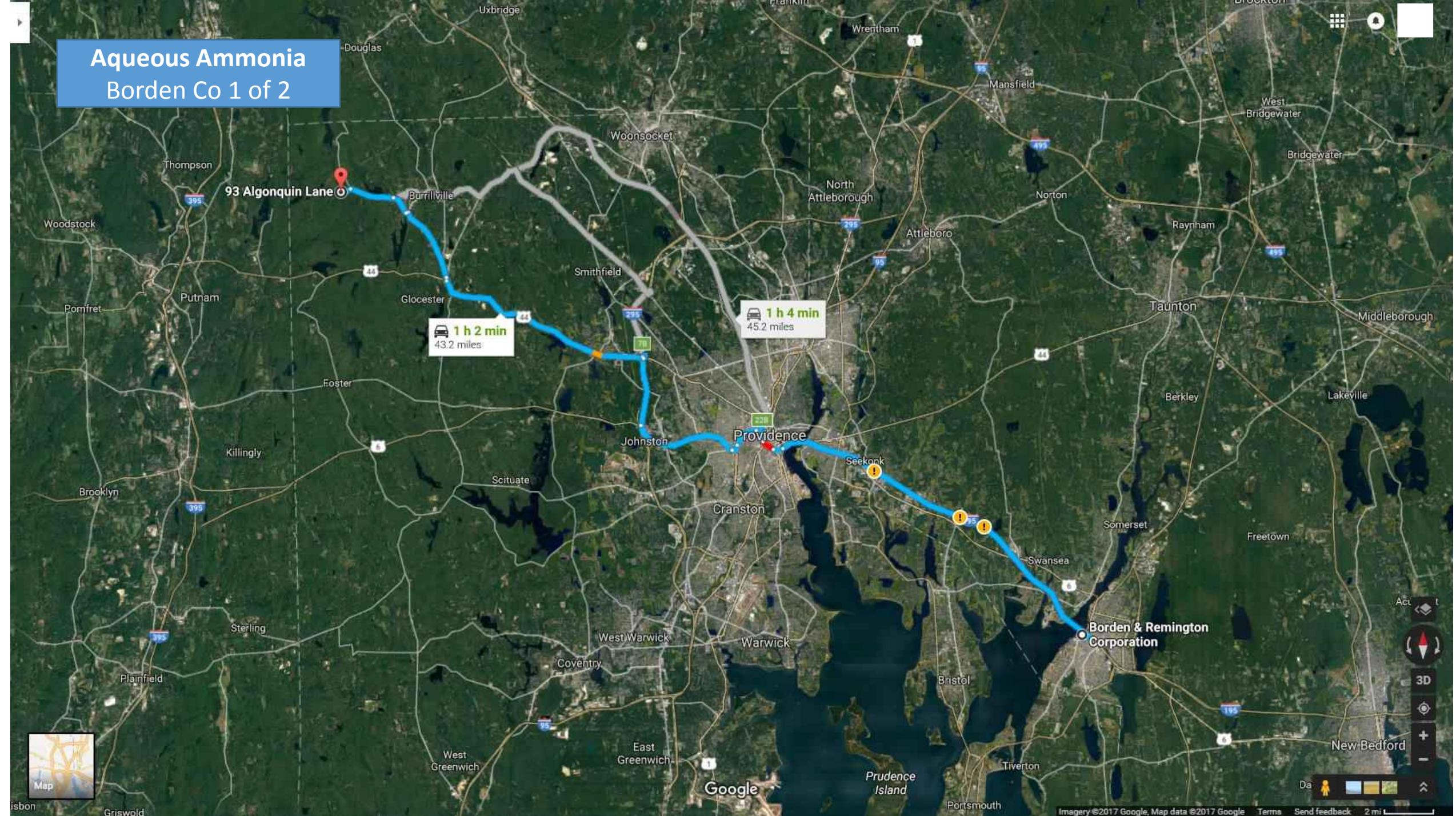
# Demin Trailer Evoqua 2 of 2

 **1 h 15 min**  
58.5 miles



# Aqueous Ammonia

## Borden Co 1 of 2



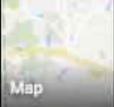
**Aqueous Ammonia**  
Borden Co 2 of 2

93 Algonquin Lane

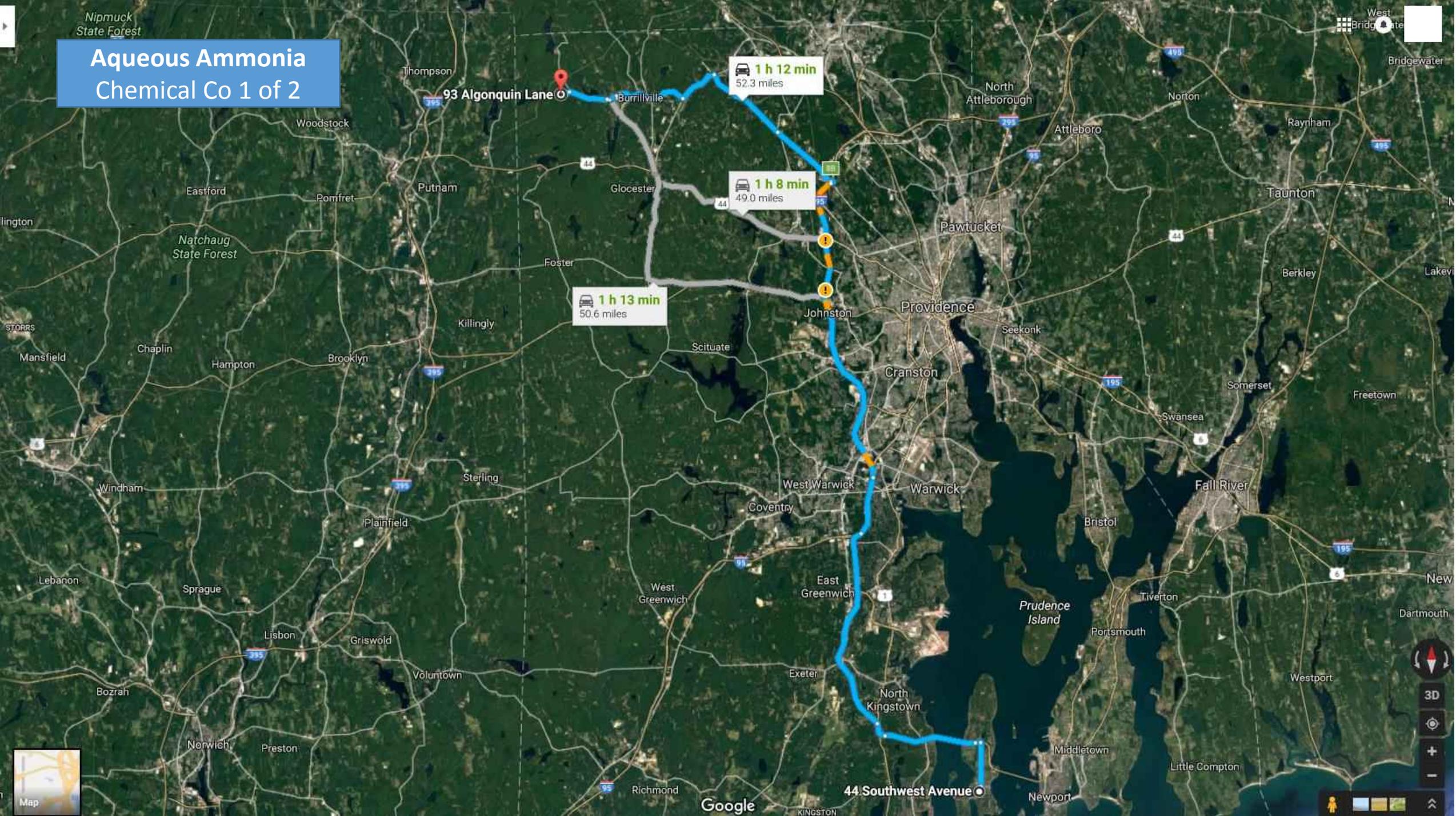
1 h 2 min  
43.2 miles

1 h 4 min  
46.4 miles

1 h 4 min  
45.2 miles



**Aqueous Ammonia  
Chemical Co 1 of 2**



# Aqueous Ammonia Chemical Co 2 of 2

93 Algonquin Lane

Nasonville

Burrillville

Smithfield

Sprague Farm  
Town Forest

Gloicester

GREENVILLE

Foster

Snake Den  
State Park

Twin River Casino

North  
Providence

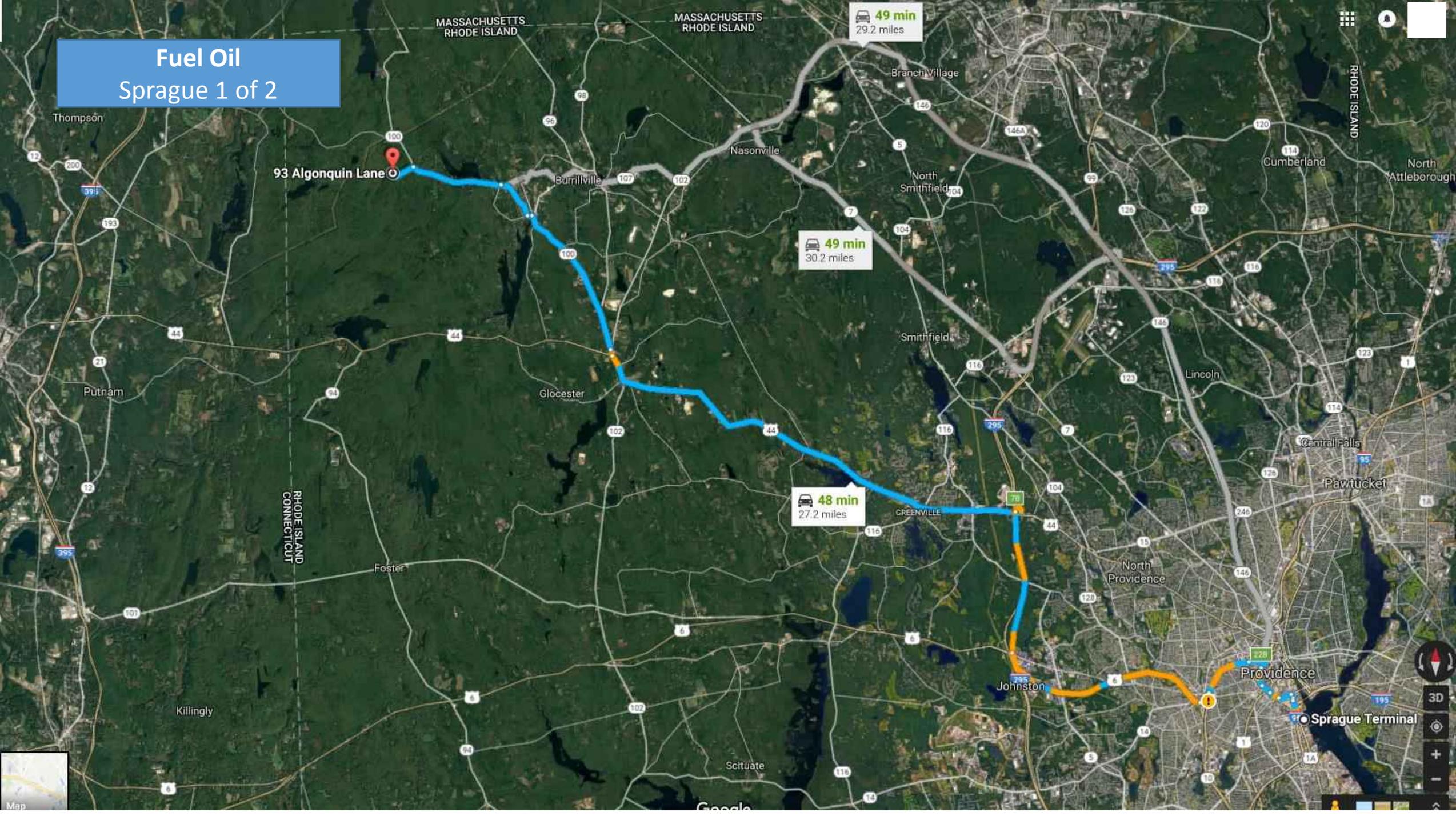
1 h 12 min  
52.3 miles

1 h 8 min  
49.0 miles

1 h 13 min  
50.6 miles

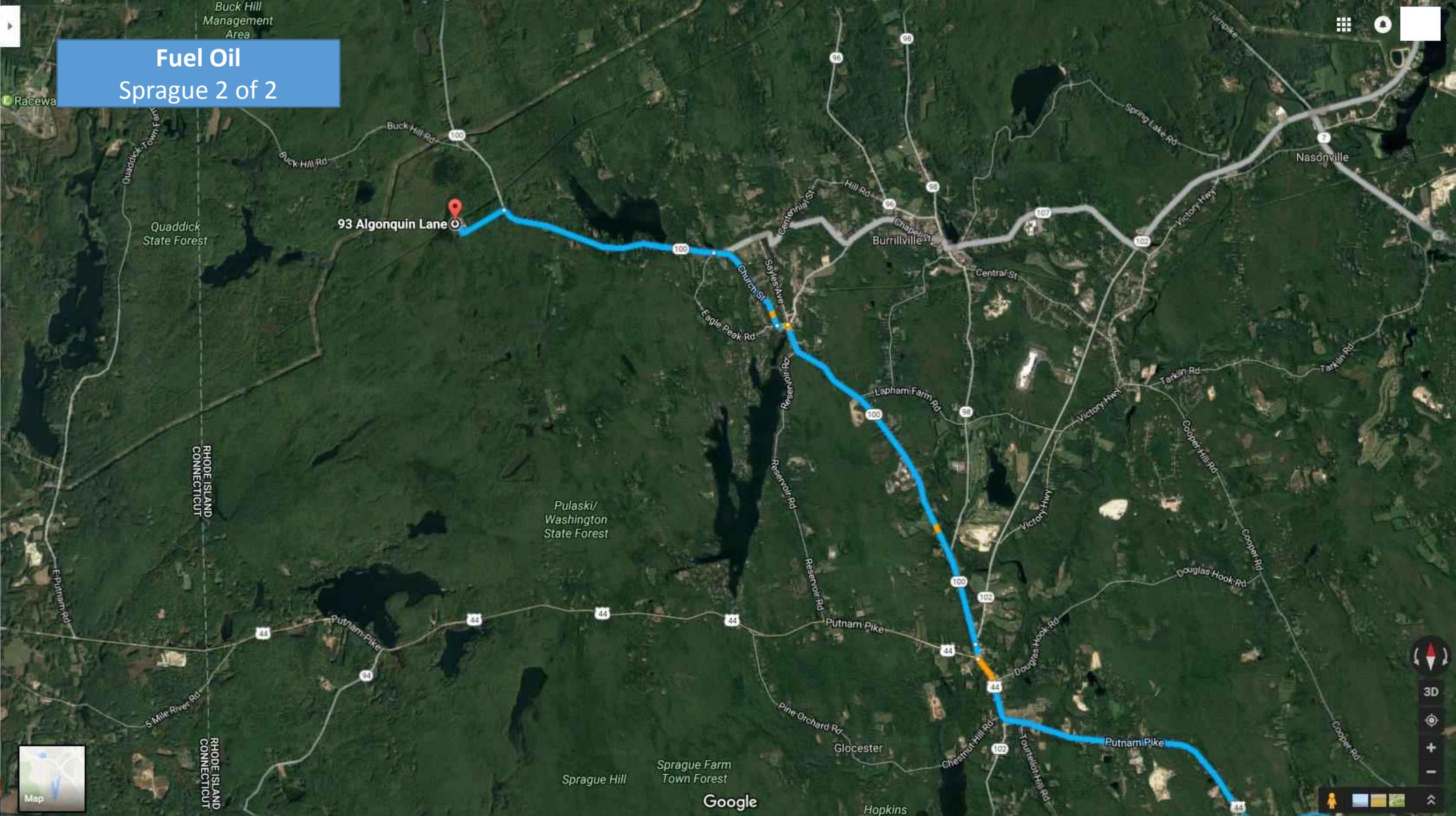
Google

# Fuel Oil Sprague 1 of 2



# Fuel Oil

## Sprague 2 of 2



# **EXHIBIT 27-19**

COMPANY IDENTITY: KLEAN CORP INTERNATIONAL  
PRODUCT IDENTITY: SAFEKLEAN DFD120

SDS DATE: 04/18/2015  
REPLACES: 07/01/2009

### SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements of the Global Harmonizing System.  
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)  
IMPORTANT: Read this SDS before handling & disposing of this product.  
Pass this information on to employees, customers, & users of this product.

#### SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: SAFEKLEAN DFD120  
SYNONYMS: None  
PRODUCT USES: Description: Low foaming concentrated industrial strength mill oil degreaser and water-soluble dirt cleaner.  
Application: To complete all pre-commissioning degreasing projects.

COMPANY IDENTITY: KLEAN CORP INTERNATIONAL  
COMPANY ADDRESS: 601 JOHN STOCKBAUER  
COMPANY CITY: VICTORIA, TX 77901  
COMPANY PHONE: 1-361-578-1524  
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 or + 1 703 527-3887 (collect calls accepted)  
(USA or Canada)

#### SECTION 2. HAZARDS IDENTIFICATION

##### WARNING!!



**2.1 HAZARD STATEMENTS: (CAT = Hazard Category)**  
(H300s) HEALTH: Acute Toxicity, Oral(CAT:5)  
**H303 MAY BE HARMFUL IF SWALLOWED.**  
(H300s) HEALTH: Skin Corrosion/Irritation(CAT:2)  
**H315 CAUSES SKIN IRRITATION.**  
(H300s) HEALTH: Serious Eye Damage/Eye Irritation(CAT:2)  
**H320 CAUSES EYE IRRITATION.**  
(H300s) HEALTH: Acute Toxicity, Inhalation(CAT:4)  
**H332 HARMFUL IF INHALED.**

**2.2 PRECAUTIONARY STATEMENTS:**  
**P100s = General, P200s = Prevention, P300s = Response, P400s = Storage, P500s = Disposal**  
P260 Do not breathe dust/fume/gas/mist/vapors/spray.  
P262 Do not get in eyes, on skin, or on clothing.  
P280 Wear protective gloves/protective clothing/eye protection/face protection.  
P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P302+352 IF ON SKIN: Wash with plenty of soap and water.  
P314 Get medical advice/attention if you feel unwell.  
P332+313 IF SKIN irritation occurs: Get medical advice/attention.

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

COMPANY IDENTITY: KLEAN CORP INTERNATIONAL  
 PRODUCT IDENTITY: SAFEKLEAN DFD120

SDS DATE: 04/18/2015  
 REPLACES: 07/01/2009

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	85-95
Sodium Metasilicate	6834-92-0	-	0-10
Octenylsuccinic Acid	28805-58-5	-	0- 5
Sodium Xylene Sulfonate	1300-72-7	-	0- 5
Nonylphenol Ethoxylate	9016-45-9	-	0- 5

The specific chemical component identities and/or the exact component percentages of this material may be withheld as trade secrets. This information is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of 29 CFR 1910.1200 (I)(1).

TRACE COMPONENTS: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

### SECTION 4. FIRST AID MEASURES

#### 4.1 MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE & CHRONIC:

See Section 11 for symptoms/effects, acute & chronic.

#### 4.2 GENERAL ADVICE:

First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists, refer to Section 8 for specific personal protective equipment.

#### 4.3 EYE CONTACT:

If this product enters the eyes, check for and remove any contact lenses. Open eyes while under gently running water. Use sufficient force to open eyelids. "Roll" eyes to expose more surface. Minimum flushing is for 15 minutes. Seek immediate medical attention.

#### 4.4 SKIN CONTACT:

If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

#### 4.5 INHALATION:

After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). Seek immediate medical attention.

#### 4.6 SWALLOWING:

If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, give two glasses of water to drink. DO NOT INDUCE VOMITING. Never induce vomiting or give liquids to someone who is unconscious, having convulsions, or unable to swallow. Seek immediate medical attention.

#### 4.7 RESCUERS: Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and SDS to physician or health professional with victim.

#### 4.8 NOTES TO PHYSICIAN:

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Any material aspirated during vomiting may cause lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be done by means least likely to cause aspiration (such as: Gastric lavage after endotracheal intubation).

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### SECTION 5. FIRE FIGHTING MEASURES

- 5.1 FIRE & EXPLOSION PREVENTIVE MEASURES:  
NO open flames.
- 5.2 SUITABLE (& UNSUITABLE) EXTINGUISHING MEDIA:  
Use dry powder.
- 5.3 SPECIAL PROTECTIVE EQUIPMENT & PRECAUTIONS FOR FIRE FIGHTERS:  
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.  
Do not enter confined fire-space without full bunker gear.  
(Helmet with face shield, bunker coats, gloves & rubber boots).
- 5.4 SPECIFIC HAZARDS OF CHEMICAL & HAZARDOUS COMBUSTION PRODUCTS:  
Isolate from oxidizers, heat, & open flame.  
Closed containers may explode if exposed to extreme heat.  
Applying to hot surfaces requires special precautions.  
Continue all label precautions!

### SECTION 6. ACCIDENTAL RELEASE MEASURES

- 6.1 SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:  
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. No action shall be taken involving personal risk without suitable training. Keep unnecessary and unprotected personnel from entering spill area. Do not touch or walk through material. Avoid breathing vapor or mist. Provide adequate ventilation. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area).
- 6.2 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, EMERGENCY PROCEDURES:  
The proper personal protective equipment for incidental releases (such as: 1 Liter of the product released in a well-ventilated area), use impermeable gloves, chemical resistant suit and boots, hard-hat, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat, and Self-Contained Breathing Apparatus or respirator.
- Personal protective equipment are required wherever engineering controls are not adequate or conditions for potential exposure exist. Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
- 6.3 ENVIRONMENTAL PRECAUTIONS:  
Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.
- 6.4 METHODS AND MATERIAL FOR CONTAINMENT & CLEAN-UP:  
Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).
- 6.5 NOTIFICATION PROCEDURES:  
In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting release of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

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## SECTION 7. HANDLING AND STORAGE

### 7.1 PRECAUTIONS FOR SAFE HANDLING:

Isolate from oxidizers, heat, & open flame. Use only with adequate ventilation. Avoid prolonged or repeated contact with skin. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. Avoid free fall of liquid. Ground containers when transferring. Do not flame cut, braze, or weld. Continue all label precautions!

### 7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:

Isolate from strong oxidants. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage.

## SECTION 7. HANDLING AND STORAGE (CONTINUED)

### 7.3 NONBULK: CONTAINERS:

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

### 7.4 BULK CONTAINERS:

All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

### 7.5 TANK CAR SHIPMENTS:

Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

### 7.6 PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:

Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

### 7.7 EMPTY CONTAINER WARNING:

Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY BURST AND CAUSE INJURY OR DEATH.**

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 EXPOSURE LIMITS:

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Sodium Metasilicate	6834-92-0	-	None Known	None Known
Octenylsuccinic Acid	28805-58-5	-	None Known	None Known
Sodium Xylene Sulfonate	1300-72-7	-	None Known	None Known
Nonylphenol Ethoxylate	9016-45-9	-	None Known	None Known

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

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## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

### 8.2 APPROPRIATE ENGINEERING CONTROLS:

#### RESPIRATORY EXPOSURE CONTROLS

Airborne concentrations should be kept to lowest levels possible. If vapor, dust or mist is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air-supplied respirator authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations, after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown. Maintain airborne contaminant concentrations below exposure limits. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For particulates, a particulate respirator (NIOSH Type N95 or better filters) may be worn. If oil particles (such as: lubricants, cutting fluids, glycerine, and so on) are present, use a NIOSH Type R or P filter. For a higher level of protection, use positive pressure supplied air respiration protection or Self-Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

#### EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS

Positive pressure, full-face piece Self-Contained Breathing Apparatus; or positive pressure, full-face piece Self-Contained Breathing Apparatus with an auxilliary positive pressure Self-Contained Breathing Apparatus.

#### VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

### 8.3 INDIVIDUAL PROTECTION MEASURES, SUCH AS PERSONAL PROTECTIVE EQUIPMENT:

#### EYE 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 or dusts. If contact is possible, chemical splash goggles should be worn, when a higher degree of protection is necessary, use splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

#### HAND PROTECTION:

Use gloves chemically resistant to this material. Glove must be inspected prior to use. Preferred examples: Butyl rubber, Chlorinated Polyethylene, Polyethylene, Ethyl vinyl alcohol laminate ("EVAL"), Polyvinyl alcohol ("PVA"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"), Neoprene, Nitrile/butadiene rubber ("nitrile") or ("NBR"), Polyvinyl chloride ("PVC") or "vinyl", Viton. 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. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good practices. Wash and dry hands.

#### BODY PROTECTION:

Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

#### WORK & HYGIENIC PRACTICES:

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using toilet facilities and at the end of the working period. Provide readily accessible eye wash stations & safety showers. Remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

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## SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Yellow
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	11.5 - 12.5
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	> 100 C / > 212 F
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-Butyl Acetate=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Not Applicable
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
VAPOR PRESSURE (mm of Hg)@20 C	17.5
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
DENSITY:	1.008 - 1.038
SPECIFIC GRAVITY (Water=1):	1.010 - 1.040
POUNDS/GALLON:	8.413 - 8.663
WATER SOLUBILITY:	Appreciable
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0
VISCOSITY @ 20 C (ASTM D445):	Not Available

\* Using CARB (California Air Resources Board Rules).

## SECTION 10. STABILITY & REACTIVITY

- 10.1 REACTIVITY & CHEMICAL STABILITY:  
 Stable under normal conditions, no hazardous reactions when kept from incompatibles.
- 10.2 POSSIBILITY OF HAZARDOUS REACTIONS & CONDITIONS TO AVOID:  
 Isolate from extreme heat, & open flame.
- 10.3 INCOMPATIBLE MATERIALS:  
 Isolate from strong oxidizers.
- 10.4 HAZARDOUS DECOMPOSITION PRODUCTS:  
 Sodium Oxide & Hydroxide, Carbon Oxides from burning.
- 10.5 HAZARDOUS POLYMERIZATION:  
 Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 ACUTE HAZARDS

- 11.1.1 SKIN CONTACT:  
 Primary irritation to skin, defatting, dermatitis.
- 11.1.2 EYE CONTACT:  
 Primary irritation to eyes, redness, tearing, blurred vision.  
 Liquid can cause eye irritation.
- 11.1.3 INHALATION:  
 Anesthetic. Irritates respiratory tract. Acute overexposure  
 can cause serious nervous system depression. Vapor harmful.
- 11.1.4 SWALLOWING:  
 Swallowing can cause abdominal irritation, nausea, vomiting & diarrhea.

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## SECTION 11. TOXICOLOGICAL INFORMATION (CONTINUED)

### 11.2 SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

#### MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Pre-existing disorders of any target organs mentioned in this Document can be aggravated by over-exposure by routes of entry to components of this product. Persons with these disorders should avoid use of this product.

### 11.3 CHRONIC HAZARDS

#### 11.3.1 CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:

This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

11.3.2 TARGET ORGANS: May cause damage to target organs, based on animal data.

11.3.3 IRRITANCY: Irritating to contaminated tissue.

11.3.4 SENSITIZATION: No component is known as a sensitizer.

11.3.5 MUTAGENICITY: No known reports of mutagenic effects in humans.

11.3.6 EMBRYOTOXICITY: No known reports of embryotoxic effects in humans.

11.3.7 TERATOGENICITY: No known reports of teratogenic effects in humans.

11.3.8 REPRODUCTIVE TOXICITY: No known reports of reproductive effects in humans.

A MUTAGEN is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate across generational lines. An EMBRYOTOXIN is a chemical which causes damage to a developing embryo (such as: within the first 8 weeks of pregnancy in humans), but the damage does not propagate across generational lines. A TERATOGEN is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A REPRODUCTIVE TOXIN is any substance which interferes in any way with the reproductive process.

### 11.4 MAMMALIAN TOXICITY INFORMATION

No mammalian information is available on this product.

## SECTION 12. ECOLOGICAL INFORMATION

### 12.1 ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

#### 12.2 EFFECT OF MATERIAL ON PLANTS AND ANIMALS:

This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

#### 12.3 EFFECT OF MATERIAL ON AQUATIC LIFE:

No aquatic environmental information is available on this product.

#### 12.4 MOBILITY IN SOIL

This material is a mobile liquid.

#### 12.5 DEGRADABILITY

This product is completely biodegradable.

#### 12.6 ACCUMULATION

Bioaccumulation of this product has not been determined.

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### SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

### SECTION 14. TRANSPORT INFORMATION

MARINE POLLUTANT: No  
 DOT/TDG SHIP NAME: Not Regulated  
 DRUM LABEL: None  
 IATA / ICAO: Not Regulated  
 IMO / IMDG: Not Regulated  
 EMERGENCY RESPONSE GUIDEBOOK NUMBER: None

### SECTION 15. REGULATORY INFORMATION

#### 15.1 EPA REGULATION:

SARA SECTION 311/312 HAZARDS: None Known

All components of this product are on the TSCA list.

SARA Title III Section 313 Supplier Notification

This product contains the indicated <\*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
*Sodium Metasilicate	6834-92-0	-	0-10	(302,313,RCRA)	None

#### 15.2 STATE REGULATIONS:

THIS PRODUCT MEETS REQUIREMENTS OF SOUTHERN CALIFORNIA AQMD RULE 443.1 & SIMILAR REGULATIONS

CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65):

This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

#### 15.3 INTERNATIONAL REGULATIONS

The identified components of this product are listed on the chemical inventories of the following countries:

Australia (AICS), Canada (DSL or NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

#### 15.4 CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

D2B: Irritating to skin / eyes.

This product was classified using the hazard criteria of the Controlled Products Regulations (CPR). This Document contains all information required by the CPR.

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**SECTION 16. OTHER INFORMATION**

**16.1 HAZARD RATINGS:**

**HEALTH (NFPA): 2, HEALTH (HMIS): 2, FLAMMABILITY: 0, PHYSICAL HAZARD: 0**  
(Personal Protection Rating to be supplied by user based on use conditions.)  
This information is intended solely for the use of individuals  
trained in the NFPA & HMIS hazard rating systems.

**16.2 EMPLOYEE TRAINING**

See Section 2 (Hazards Identification). Employees should be made aware of  
all hazards of this material (as stated in this SDS) before handling it.

**16.3 SDS DATE: 04/18/2015**

**NOTICE**

The supplier disclaims all expressed or implied warranties of merchantability or fitness  
for a specific use, with respect to the product or the information provided herein,  
except for conformation to contracted specifications. All information appearing herein  
is based upon data obtained from manufacturers and/or recognized technical sources.  
While the information is believed to be accurate, we make no representations as to its  
accuracy or sufficiency.

Conditions of use are beyond our control, and therefore users are responsible for  
verifying the data under their own operating conditions to determine whether the product  
is suitable for their particular purposes and they assume all risks of their handling,  
and disposal of the product. Users also assume all risks in regards to the publication  
or use of, or reliance upon information contained herein.  
This information relates only to the product designated herein, and does not relate to  
its use in combination with any other material or process.

Unless updated, the Safety Data Sheet is valid until 04/18/2018.



Univar USA Inc Safety Data Sheet

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SDS No:

Version No:

Order No:

3075 Highland Pkwy, Ste 200, Downers Grove, IL 60515  
(425) 889 3400

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Emergency Assistance

For emergency assistance involving chemicals call  
Chemtrec - (800) 424-9300



## SAFETY DATA SHEET

THE DOW CHEMICAL COMPANY

**Product name:** UCARSOL™ GT-8715 Antifoam

**Issue Date:** 03/22/2016

**Print Date:** 03/23/2016

THE DOW CHEMICAL COMPANY encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

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### 1. IDENTIFICATION

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**Product name:** UCARSOL™ GT-8715 Antifoam

**Recommended use of the chemical and restrictions on use**

**Identified uses:** Selection of the appropriate polyglycol product for a specific application requires knowledge of the fluid requirements of the application, awareness of the most important of these requirements, and a match-up with the properties of the various polyglycol materials. Polyglycol products can be formulated for use in numerous industry applications such as hydraulic fluids, quenchant, compressor and refrigeration lubricants, heat transfer fluids, machinery lubricants, solder assist fluids, metalworking lubricants, textile finishing, etc. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

**COMPANY IDENTIFICATION**

THE DOW CHEMICAL COMPANY  
2030 WILLARD H DOW CENTER  
MIDLAND MI 48674-0000  
UNITED STATES

**Customer Information Number:**

800-258-2436  
SDSQuestion@dow.com

**EMERGENCY TELEPHONE NUMBER**

**24-Hour Emergency Contact:** CHEMTREC +1 703-527-3887

**Local Emergency Contact:** 800-424-9300

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### 2. HAZARDS IDENTIFICATION

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**Hazard classification**

This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

**Other hazards**

No data available

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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

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**Product name: UCARSOL™ GT-8715 Antifoam**

**Issue Date: 03/22/2016**

**Synonyms:** Poly[oxy(methyl-1,2-ethanediyl)], .alpha.-butyl-.omega.-hydroxy-  
This product is a substance.

<b>Component</b>	<b>CASRN</b>	<b>Concentration</b>
Polypropylene Glycol Monobutyl Ether	9003-13-8	> 99.9 %

#### **4. FIRST AID MEASURES**

**Description of first aid measures**

**General advice:** If potential for exposure exists refer to Section 8 for specific personal protective equipment.

**Inhalation:** Move person to fresh air; if effects occur, consult a physician.

**Skin contact:** Wash off with plenty of water.

**Eye contact:** Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

**Ingestion:** No emergency medical treatment necessary.

**Most important symptoms and effects, both acute and delayed:** Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

**Indication of any immediate medical attention and special treatment needed**

**Notes to physician:** No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

#### **5. FIREFIGHTING MEASURES**

**Suitable extinguishing media:** Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

**Unsuitable extinguishing media:** Do not use direct water stream. May spread fire.

**Special hazards arising from the substance or mixture**

**Hazardous combustion products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

**Unusual Fire and Explosion Hazards:** Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

**Advice for firefighters**

**Product name:** UCARSOL™ GT-8715 Antifoam

**Issue Date:** 03/22/2016

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.

**Special protective equipment for firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

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## 6. ACCIDENTAL RELEASE MEASURES

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**Personal precautions, protective equipment and emergency procedures:** Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to section 7, Handling, for additional precautionary measures.

**Environmental precautions:** Material will float on water. Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

**Methods and materials for containment and cleaning up:** Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

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## 7. HANDLING AND STORAGE

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**Precautions for safe handling:** No special precautions required.

Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

**Conditions for safe storage:** Store in the following material(s): 316 stainless steel. Carbon steel. Glass-lined container. Polypropylene. Polyethylene-lined container. Stainless steel. Teflon. This material may soften and lift certain paint and surface coatings. Use product promptly after opening. Store in original unopened container. Unopened containers of material stored beyond the recommended shelf life should be retested against the sales specifications before use. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

**Storage stability**

<b>Storage Period:</b>	
<b>Metal drums.</b>	36 Month
<b>Bulk</b>	18 Month

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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**Control parameters**

Exposure limits are listed below, if they exist.

**Product name:** UCARSOL™ GT-8715 Antifoam

**Issue Date:** 03/22/2016

Exposure limits have not been established for those substances listed in the composition, if any have been disclosed.

#### Exposure controls

**Engineering controls:** Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

#### Individual protection measures

**Eye/face protection:** Use safety glasses (with side shields).

##### Skin protection

**Hand protection:** Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Neoprene. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). Nitrile/butadiene rubber ("nitrile" or "NBR").  
**NOTICE:** The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Other protection:** Wear clean, body-covering clothing.

**Respiratory protection:** Under intended handling conditions, no respiratory protection should be needed.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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### Appearance

Physical state	Liquid.
Color	Colorless to yellow
Odor	Mild
Odor Threshold	No test data available
pH	5.0 - 8.5 <i>ASTM E70</i> (16.7% in isopropanol/water, 10:6)
Melting point/range	No test data available
Freezing point	See Pour Point
Boiling point (760 mmHg)	> 200 °C (> 392 °F) <i>Calculated.</i>
Flash point	<b>closed cup</b> 188 °C (370 °F) <i>ASTM D 93</i>
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	< 0.01 mmHg at 20 °C (68 °F) <i>ASTM E1719</i>
Relative Vapor Density (air = 1)	>1 <i>Calculated.</i>
Relative Density (water = 1)	1.000 at 20 °C (68 °F) / 20 °C <i>Calculated.</i>
Water solubility	< 0.1 % <i>Visual</i>

**Product name: UCARSOL™ GT-8715 Antifoam**

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<b>Partition coefficient: n-octanol/water</b>	No data available
<b>Auto-ignition temperature</b>	No test data available
<b>Decomposition temperature</b>	No test data available
<b>Kinematic Viscosity</b>	370 cSt at 40 °C (104 °F) <i>ASTM D 445</i>
<b>Explosive properties</b>	No data available
<b>Oxidizing properties</b>	No data available
<b>Molecular weight</b>	2,490 g/mol <i>Calculated.</i>
<b>Percent volatility</b>	<i>Not reported</i> No test data available
<b>Pour point</b>	-23.3 °C (-9.9 °F) <i>ASTM D97</i>
<b>Volatile Organic Compounds</b>	0.00 g/L <i>EPA Method No. 24</i>

NOTE: The physical data presented above are typical values and should not be construed as a specification.

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** No data available

**Chemical stability:** Thermally stable at typical use temperatures.

**Possibility of hazardous reactions:** Polymerization will not occur.

**Conditions to avoid:** Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

**Incompatible materials:** Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

**Hazardous decomposition products:** Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers. Hydrocarbons. Ketones. Organic acids. Polymer fragments.

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## 11. TOXICOLOGICAL INFORMATION

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*Toxicological information appears in this section when such data is available.*

### Acute toxicity

#### Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

LD50, Rat, > 45,000 mg/kg

#### Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 20,000 mg/kg

#### Acute inhalation toxicity

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At room temperature, exposure to vapor is minimal due to low volatility; single exposure is not likely to be hazardous. For respiratory irritation and narcotic effects: No relevant data found.  
As product: The LC50 has not been determined.  
For similar material(s):

**Skin corrosion/irritation**

Brief contact is essentially nonirritating to skin.

**Serious eye damage/eye irritation**

Essentially nonirritating to eyes.

**Sensitization**

Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:

No relevant data found.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

**Specific Target Organ Systemic Toxicity (Repeated Exposure)**

Based on available data, repeated exposures to small amounts are not anticipated to cause significant adverse effects.

**Carcinogenicity**

No relevant data found.

**Teratogenicity**

No relevant data found.

**Reproductive toxicity**

No relevant data found.

**Mutagenicity**

No relevant data found.

**Aspiration Hazard**

Based on physical properties, not likely to be an aspiration hazard.

**COMPONENTS INFLUENCING TOXICOLOGY:**

**Polypropylene Glycol Monobutyl Ether**

**Acute inhalation toxicity**

At room temperature, exposure to vapor is minimal due to low volatility; single exposure is not likely to be hazardous. For respiratory irritation and narcotic effects: No relevant data found.

As product: The LC50 has not been determined.

For similar material(s): No deaths occurred following exposure to a saturated atmosphere.

**Product name: UCARSOL™ GT-8715 Antifoam**

**Issue Date: 03/22/2016**

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## 12. ECOLOGICAL INFORMATION

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*Ecotoxicological information appears in this section when such data is available.*

### Toxicity

#### Acute toxicity to fish

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 180 - 648 mg/l

#### Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), static test, 48 Hour, 520 mg/l

#### Acute toxicity to algae/aquatic plants

EC50, Skeletonema costatum (marine diatom), static test, 96 Hour, Growth inhibition (cell density reduction), 12.7 mg/l, OECD Test Guideline 201 or Equivalent

ErC50, Skeletonema costatum (marine diatom), static test, 96 Hour, Growth rate inhibition, 36.2 mg/l, OECD Test Guideline 201 or Equivalent

#### Toxicity to bacteria

IC50, Bacteria, static test, 16 Hour, Growth inhibition, > 50,000 mg/l

### Persistence and degradability

**Biodegradability:** Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%).

10-day Window: Fail

**Biodegradation:** 23 %

**Exposure time:** 28 d

**Method:** OECD Test Guideline 301B or Equivalent

**Chemical Oxygen Demand:** 2.08 mg/mg

#### Biological oxygen demand (BOD)

Incubation Time	BOD
5 d	< 5 %
10 d	< 5 %
20 d	8 %

### Bioaccumulative potential

**Bioaccumulation:** No bioconcentration is expected because of the relatively high molecular weight (MW greater than 1000).

### Mobility in soil

No relevant data found.

**Product name:** UCARSOL™ GT-8715 Antifoam

**Issue Date:** 03/22/2016

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### 13. DISPOSAL CONSIDERATIONS

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**Disposal methods:** DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

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### 14. TRANSPORT INFORMATION

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**DOT**

Not regulated for transport

**Classification for SEA transport (IMO-IMDG):**

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

Not regulated for transport  
Consult IMO regulations before transporting ocean bulk

**Classification for AIR transport (IATA/ICAO):**

Not regulated for transport

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

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### 15. REGULATORY INFORMATION

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**OSHA Hazard Communication Standard**

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

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

This product is not a hazardous chemical under 29CFR 1910.1200, and therefore is not covered by Title III of SARA.

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**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**Pennsylvania Worker and Community Right-To-Know Act:**

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)**

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**United States TSCA Inventory (TSCA)**

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

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**16. OTHER INFORMATION**

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**Hazard Rating System**

**NFPA**

Health	Fire	Reactivity
0	1	0

**Revision**

Identification Number: 101197089 / A001 / Issue Date: 03/22/2016 / Version: 5.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

**Information Source and References**

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

THE DOW CHEMICAL COMPANY urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

## Univar USA Inc Safety Data Sheet

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For Additional Information contact SDS Coordinator during business hours, Pacific time: (425) 889-3400

### **Notice**

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this SDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

COMPANY IDENTITY: KLEAN CORP INTERNATIONA  
 PRODUCT IDENTITY: SAFEKLEAN 3100

SDS DATE: 03/26/2015  
 ORIGINAL: 03/26/2015

## SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements of the Global Harmonizing System.  
 THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)  
 IMPORTANT: Read this SDS before handling & disposing of this product.  
 Pass this information on to employees, customers, & users of this product.

### SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: SAFEKLEAN 3100  
 SYNONYMS: None  
 PRODUCT USES: Strong Acid solution Cleaner

COMPANY IDENTITY: KLEAN CORP INTERNATIONAL  
 COMPANY ADDRESS: 107 JOHN STOCKBAUER  
 COMPANY CITY: VICTORIA, TX 77901  
 COMPANY PHONE: 1-361-578-1524  
 EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 or + 1 703 527-3887 (collect calls accepted)  
 (USA or Canada)

### SECTION 2. HAZARDS IDENTIFICATION

**DANGER!!**



#### 2.1 HAZARD STATEMENTS: (CAT = Hazard Category)

- (H200s) PHYSICAL: Corrosive to Metals(CAT:1)  
**H290 MAY BE CORROSIVE TO METALS.**
- (H300s) HEALTH: Acute Toxicity, Oral(CAT:4)  
**H302 HARMFUL IF SWALLOWED.**
- (H300s) HEALTH: Aspiration Hazard(CAT:1)  
**H304 MAY BE FATAL IF SWALLOWED AND ENTERS AIRWAYS.**
- (H300s) HEALTH: Skin Corrosion/Irritation(CAT:1)  
**H314 CAUSES SEVERE SKIN BURNS AND EYE DAMAGE.**
- (H300s) HEALTH: Acute Toxicity, Inhalation(CAT:3)  
**H331 TOXIC IF INHALED.**
- (H300s) HEALTH: Target Organ Toxicity, Single Exposure(CAT:3)  
**H335 MAY CAUSE RESPIRATORY IRRITATION.**
- (H300s) HEALTH: Target Organ Toxicity, Single Exposure(CAT:2)  
**H371 MAY CAUSE DAMAGE TO ORGANS. (See Section 11 for Target Organ Information)**
- (H400s) ENVIRONMENT: Hazardous to Aquatic Environment, Acute(CAT:3)  
**H402 HARMFUL TO AQUATIC LIFE.**

#### 2.2 PRECAUTIONARY STATEMENTS:

##### EXPOSURE PREVENTION:

**P100s = General, P200s = Prevention, P300s = Response, P400s = Storage, P500s = Disposal**

- P264 Wash with soap & water thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P301+310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- P301+330+331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
- P303+361+353 IF ON SKIN (OR HAIR): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+340 IF INHALED: Remove victim to fresh air & keep at rest in a position comfortable for breathing.
- P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present & easy to do - Continue rinsing.
- P309+311 If exposed or you feel unwell: Call a POISON CENTER or doctor/physician.
- P310 Immediately call a POISON CENTER or doctor/physician.
- P331 Do NOT induce vomiting.
- P363 Wash contaminated clothing before reuse.
- P390 Absorb spillage to prevent material damage.
- P403+233 Store in a well-ventilated place. Keep container tightly closed.
- P405 Store locked up.
- P500 Dispose of contents/container following local/regional/federal regulations.
- P405 Store locked up.
- P406 Store in corrosive resistant container with a resistant inner liner.
- P500 Dispose of contents/container following local/regional/federal regulations.

**SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.**

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### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	70-80
Hydrochloric Acid	7647-01-0	231-595-7	20-30
Phosphoric Acid	7664-38-2	231-633-2	0- 5
Oxalic Acid	6153-56-6	205-634-3	0- 5
2-Butoxyethanol	111-76-2	203-905-0	0- 1
Olelyl Alcohol Ethoxylate	Confidential	-	0- 1
Cyclic Amine reaction product with acetophenone and formaldehyde acid salt	Confidential	-	0- 1

The specific chemical component identities and/or the exact component percentages of this material may be withheld as trade secrets. This information is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of 29 CFR 1910.1200 (I)(1).

TRACE COMPONENTS: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

### SECTION 4. FIRST AID MEASURES

#### 4.1 MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE & CHRONIC:

See Section 11 for Symptoms/Effects (acute & chronic).

#### 4.2 EYE CONTACT:

For eyes, flush with plenty of water for 15 minutes & get medical attention.

#### 4.3 SKIN CONTACT:

In case of contact with skin immediately remove contaminated clothing. Wash thoroughly with soap & water. Wash contaminated clothing before reuse.

#### 4.4 INHALATION:

After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

#### 4.5 SWALLOWING:

Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting. GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

### SECTION 5. FIRE FIGHTING MEASURES

#### 5.1 FIRE & EXPLOSION PREVENTIVE MEASURES:

NO open flames. Above flash point, use a closed system, ventilation,

#### 5.2 SUITABLE (& UNSUITABLE) EXTINGUISHING MEDIA:

Use dry powder, alcohol-resistant foam, water spray, carbon dioxide.

#### 5.3 SPECIAL PROTECTIVE EQUIPMENT & PRECAUTIONS FOR FIRE FIGHTERS:

Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used. Do not enter confined fire-space without full bunker gear. (Helmet with face shield, bunker coats, gloves & rubber boots).

#### 5.4 SPECIFIC HAZARDS OF CHEMICAL & HAZARDOUS COMBUSTION PRODUCTS:

##### SLIGHTLY COMBUSTIBLE!

Reacts with most metals producing hydrogen which is extremely flammable & may explode. Keep container tightly closed. Isolate from oxidizers, alkalis, heat, & open flame.

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## SECTION 6. ACCIDENTAL RELEASE MEASURES

### 6.1 SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. No action shall be taken involving personal risk without suitable training. Keep unnecessary and unprotected personnel from entering spill area. Do not touch or walk through material. Avoid breathing vapor or mist. Provide adequate ventilation. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area).

### 6.2 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, EMERGENCY PROCEDURES:

The proper personal protective equipment for incidental releases (such as: 1 liter of the product released in a well-ventilated area), use impermeable gloves, chemical resistant suit and boots, hard-hat, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat, and Self-Contained Breathing Apparatus or respirator.

Personal protective equipment are required wherever engineering controls are not adequate or conditions for potential exposure exist. Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

### 6.3 ENVIRONMENTAL PRECAUTIONS:

Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.

### 6.4 METHODS AND MATERIAL FOR CONTAINMENT & CLEAN-UP:

Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. Dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).

### 6.5 NOTIFICATION PROCEDURES:

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting release of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

## SECTION 7. HANDLING AND STORAGE

### 7.1 PRECAUTIONS FOR SAFE HANDLING:

Isolate from oxidizers, alkalis, heat, & open flame. Use only with adequate ventilation. Avoid breathing of vapor or spray mist. Do not get in eyes, on skin or clothing. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. Avoid free fall of liquid. Ground containers when transferring. Do not flame cut, braze, or weld. Continue all label precautions! NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.

### 7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:

Keep separated from strong oxidants, strong bases, combustible & reducing substances, metals, food & feedstuffs. Keep cool. Keep dry. Keep inside a well-ventilated room. See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage. Reacts with most metals producing hydrogen which is extremely flammable & may explode. Wear full face shield, gloves & full protective clothing when opening or handling. When empty, drain completely, replace bungs securely.

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ORIGINAL: 03/26/2015

**SECTION 7. HANDLING AND STORAGE (CONTINUED)****7.3 NONBULK: CONTAINERS:**

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

**7.4 BULK CONTAINERS:**

All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

**7.5 TANK CAR SHIPMENTS:**

Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

**7.6 PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:**

Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

**7.7 EMPTY CONTAINER WARNING:**

Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY BURST AND CAUSE INJURY OR DEATH.**

**SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION****8.1 EXPOSURE LIMITS:**

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Hydrochloric Acid	7647-01-0	231-595-7	5 ppm	2 ppm
Phosphoric Acid	7664-38-2	231-633-2	None Known	None Known
Oxalic Acid	6153-56-6	205-634-3	None Known	None Known
2-Butoxyethanol	111-76-2	203-905-0	50 ppm S	20 ppm S
Olelyl Alcohol Ethoxylate	Confidential	-	None Known	None Known
Cyclic Amine reaction product with acetophenone and formaldehyde acid salt	Confidential	-	None Known	None Known

MATERIAL	CAS#	EINECS#	CEILING	STEL (OSHA/ACGIH)	HAP
Hydrochloric Acid	7647-01-0	231-595-7	None Known	5 ppm	Yes
Phosphoric Acid	7664-38-2	231-633-2	None Known	3 ppm	No

Each component showing 'Yes' under "HAP" is an EPA Hazardous Air Pollutant.

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## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

### 8.2 APPROPRIATE ENGINEERING CONTROLS:

#### RESPIRATORY EXPOSURE CONTROLS

Airborne concentrations should be kept to lowest levels possible. If vapor, dust or mist is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air-supplied respirator authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations, after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown. Maintain airborne contaminant concentrations below exposure limits. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For particulates, a particulate respirator (NIOSH Type N95 or better filters) may be worn. If oil particles (such as: lubricants, cutting fluids, glycerine, and so on) are present, use a NIOSH Type R or P filter. For a higher level of protection, use positive pressure supplied air respiration protection or Self-Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

#### EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS

Positive pressure, full-face piece Self-Contained Breathing Apparatus; or positive pressure, full-face piece Self-Contained Breathing Apparatus with an auxilliary positive pressure Self-Contained Breathing Apparatus.

#### VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

### 8.3 INDIVIDUAL PROTECTION MEASURES, SUCH AS PERSONAL PROTECTIVE EQUIPMENT:

#### EYE 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 or dusts. If contact is possible, chemical splash goggles should be worn, when a higher degree of protection is necessary, use splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

#### HAND PROTECTION:

Use gloves chemically resistant to this material. Glove must be inspected prior to use. Preferred examples: Butyl rubber, Chlorinated Polyethylene, Polyethylene, Ethyl vinyl alcohol laminate ("EVAL"), Polyvinyl alcohol ("PVA"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"), Neoprene, Nitrile/butadiene rubber ("nitrile") or ("NBR"), Polyvinyl chloride ("PVC") or "vinyl", Viton. 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. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good practices. Wash and dry hands.

#### BODY PROTECTION:

Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

#### WORK & HYGIENIC PRACTICES:

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using toilet facilities and at the end of the working period. Provide readily accessible eye wash stations & safety showers. Remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

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### SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Orange
ODOR:	Sharp, acid
ODOR THRESHOLD:	Not Available
pH (Neutrality):	0.1 to 1.0
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	81 95 100* C / 178 203 212* F (*=End Point)
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-Butyl Acetate=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Not Applicable
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.1
VAPOR DENSITY (air=1):	0.769
GRAVITY @ 68/68 F / 20/20 C:	
DENSITY:	1.118 - 1.148
SPECIFIC GRAVITY (Water=1):	1.120 - 1.150
POUNDS/GALLON:	9.33 - 9.58
WATER SOLUBILITY:	Appreciable
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	398 C / 750 F
DECOMPOSITION TEMPERATURE:	Not Available
VOCs (>0.044 Lbs/Sq In) :	0.0 Vol% / 0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.35 Vol% / 2.7 g/L / .0 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.35 Vol% / 2.7 g/L / .0 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	24.2 Wt% / 274.9 g/L / 2.2 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0
VISCOSITY @ 20 C (ASTM D445):	Not Available

\* Using CARB (California Air Resources Board Rules).

### SECTION 10. STABILITY & REACTIVITY

#### 10.1 REACTIVITY & CHEMICAL STABILITY:

Stable under normal conditions, but Reacts with most metals producing hydrogen which is extremely flammable & may explode.

#### 10.2 POSSIBILITY OF HAZARDOUS REACTIONS & CONDITIONS TO AVOID:

Isolate from oxidizers, alkalis, heat, & open flame.

#### 10.3 INCOMPATIBLE MATERIALS:

The substance is a strong acid, reacts violently with bases and is corrosive. This substance violently polymerizes under the influence of azo compounds, and epoxides. On combustion forms irritating and toxic gases including phosphorus oxides, Reacts violently with strong oxidants, forming toxic gas (chlorine). Reacts violently with strong bases, causing fire & explosion hazard. Reacts with alcohols, aldehydes, ketones, phenols, esters, halogenated organics. Reacts with amines, cyanides. sulfides. producing toxic fumes. Attacks many metals. forming flammable/explosive gas (hydrogen).

#### 10.4 HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon Monoxide, Carbon Dioxide, Hydrogen Chloride, Phosgene from burning.

#### 10.5 HAZARDOUS POLYMERIZATION:

Will not occur.

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## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 ACUTE HAZARDS

#### 11.1.1 SKIN CONTACT:

Severe burns to skin, defatting, dermatitis.  
 Wash thoroughly after handling.

#### 11.1.2 EYE CONTACT:

Severe burns to eyes, redness, tearing, blurred vision.  
 Liquid can cause severe skin & eye burns.

#### 11.1.3 INHALATION:

Severe respiratory tract irritation may occur. Vapor harmful.

#### 11.1.4 SWALLOWING:

**ASPIRATION HAZARD!** Harmful or fatal if swallowed. Do NOT induce vomiting.  
 If spontaneous vomiting occurs, keep victim's head below the waist to prevent aspiration. Swallowing can cause abdominal irritation, nausea, vomiting & diarrhea.  
 The symptoms of chemical pneumonitis may not show up for a few days.

### 11.2 SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

#### MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Pre-existing disorders of any target organs mentioned in this Document can be aggravated by over-exposure by routes of entry to components of this product. Persons with these disorders should avoid use of this product.

### 11.3 CHRONIC HAZARDS

#### 11.3.1 CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:

This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

11.3.2 TARGET ORGANS: May cause damage to target organs, based on animal data.

11.3.3 IRRITANCY: Irritating to contaminated tissue.

11.3.4 SENSITIZATION: No component is known as a sensitizer.

11.3.5 MUTAGENICITY: No known reports of mutagenic effects in humans.

11.3.6 EMBRYOTOXICITY: No known reports of embryotoxic effects in humans.

11.3.7 TERATOGENICITY: No known reports of teratogenic effects in humans.

11.3.8 REPRODUCTIVE TOXICITY: No known reports of reproductive effects in humans.

A MUTAGEN is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate across generational lines. An EMBRYOTOXIN is a chemical which causes damage to a developing embryo (such as: within the first 8 weeks of pregnancy in humans), but the damage does not propagate across generational lines. A TERATOGEN is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A REPRODUCTIVE TOXIN is any substance which interferes in any way with the reproductive process.

### 11.4 MAMMALIAN TOXICITY INFORMATION

MATERIAL	CAS#	EINECS#	LOWEST KNOWN LETHAL DOSE DATA LOWEST KNOWN LD50 (ORAL)
Phosphoric Acid	7664-38-2	231-791-2	1500.0 mg/kg(Rats)

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## SECTION 12. ECOLOGICAL INFORMATION

### 12.1 ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

### 12.2 EFFECT OF MATERIAL ON PLANTS AND ANIMALS:

This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

### 12.3 EFFECT OF MATERIAL ON AQUATIC LIFE:

The most sensitive known aquatic group to any component of this product is: Tidewater Silversides 1250 ppm or mg/L (96 hour exposure).  
 Keep out of sewers and natural water supplies.

### 12.4 MOBILITY IN SOIL

This material is a mobile liquid.

### 12.5 DEGRADABILITY

This product is partially biodegradable.

### 12.6 ACCUMULATION

Bioaccumulation of this product has not been determined.

## SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

## SECTION 14. TRANSPORT INFORMATION

MARINE POLLUTANT: No  
 DOT/TDG SHIP NAME: UN1760, Corrosive Liquid, 8, PG-II  
 DRUM LABEL: (CORROSIVE)  
 IATA / ICAO: UN1760, Corrosive Liquid, 8, PG-II  
 IMO / IMDG: UN1760, Corrosive Liquid, 8, PG-II  
 EMERGENCY RESPONSE GUIDEBOOK NUMBER: 157

## SECTION 15. REGULATORY INFORMATION

### 15.1 EPA REGULATION:

#### SARA SECTION 311/312 HAZARDS: Acute Health, Chronic Health

All components of this product are on the TSCA list.

#### SARA Title III Section 313 Supplier Notification

This product contains the indicated <\*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG. SECTION)	RQ(LBS)
*Hydrochloric Acid	7647-01-0	231-595-7	0-10	(302,311,312,313)	5000
*2-Butoxyethanol	111-76-2	203-905-0	0- 1	(313)	None

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## SECTION 15. REGULATORY INFORMATION (CONTINUED)

Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively. Failure to report may result in substantial civil and criminal penalties. State & local regulations may be more restrictive than federal regulations.

### 15.2 STATE REGULATIONS:

#### CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65):

This product contains no chemicals known to the State of California

to cause cancer or reproductive toxicity.

### 15.3 INTERNATIONAL REGULATIONS

The identified components of this product are listed on the chemical inventories of the following countries:

Australia (AICS), Canada (DSL or NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

### 15.4 CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

D1B: Toxic material causing immediate and serious toxic effects.

E: Corrosive Material.

This product was classified using the hazard criteria of the Controlled Products Regulations (CPR). This Document contains all information required by the CPR.

## SECTION 16. OTHER INFORMATION

### 16.1 HAZARD RATINGS:

HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, PHYSICAL HAZARD: 0

(Personal Protection Rating to be supplied by user based on use conditions.)

This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

### 16.2 EMPLOYEE TRAINING

See Section 2 (Hazards Identification). Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

### 16.3 SDS DATE: 03/26/2015

### NOTICE

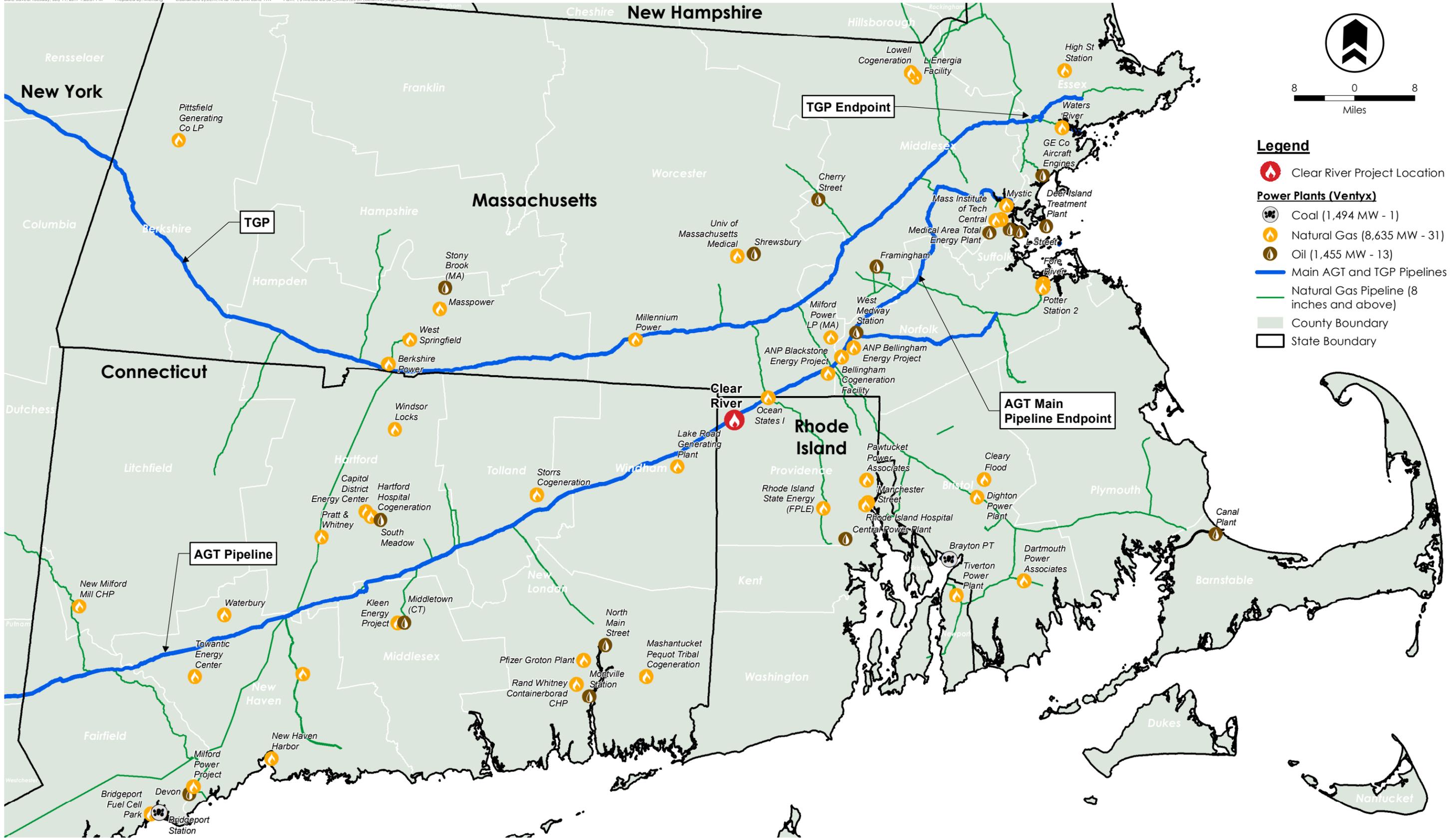
The supplier disclaims all expressed or implied warranties of merchantability or fitness for a specific use, with respect to the product or the information provided herein, except for conformation to contracted specifications. All information appearing herein is based upon data obtained from manufacturers and/or recognized technical sources. While the information is believed to be accurate, we make no representations as to its accuracy or sufficiency.

Conditions of use are beyond our control, and therefore users are responsible for verifying the data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their handling, and disposal of the product. Users also assume all risks in regards to the publication or use of, or reliance upon information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or process.

Unless updated, the Safety Data Sheet is valid until 03/26/2018.

**EXHIBIT 27-22(a)**



**Legend**

- Clear River Project Location
- Power Plants (Ventyx)**
- Coal (1,494 MW - 1)
- Natural Gas (8,635 MW - 31)
- Oil (1,455 MW - 13)
- Main AGT and TGP Pipelines
- Natural Gas Pipeline (8 inches and above)
- County Boundary
- State Boundary

# Power Plants Locations

Clear River Thermal Energy Plant | Providence County, Rhode Island

Rev. 04  
July 11, 2017



# **EXHIBIT 27-22(b)**

Plant Operator Name	Primary Fuel Source	# Of Units	# Of Units Gas	# Of Units Oil	Total Capacity (MW)	Mainline or Lateral	Generation at Risk	State
Mystic 7	Gas	1	1	1	583	Lateral	<input checked="" type="checkbox"/>	MA
Fore River	Gas	1	1	0	837	Lateral		MA
Kleen Energy Project	Gas	1	1	0	620	Lateral		CT
New Haven Harbor	Gas	4	3	1	582	Lateral	<input checked="" type="checkbox"/>	CT
Newington Power Facility	Gas	1	1	0	561	Lateral		NH
Westbrook Energy Center	Gas	1	1	0	548	Lateral		ME
Stony Brook (MA)	Oil	6	1	5	531	Lateral		MA
Manchester Street	Gas	3	3	0	510	Lateral		RI
Bellingham Cogeneration Fac	Gas	1	1	0	330	Mainline		MA
Ocean States II	Gas	1	1	0	318	Mainline		RI
Bucksport Mill	Gas	4	4	0	300	Lateral		ME
Kendall Square Station	Gas	2	1	1	267	Lateral		MA
Ocean States I	Gas	1	1	0	239	Mainline		RI
West Springfield	Gas	4	2	2	217	Lateral	<input checked="" type="checkbox"/>	MA
Potter Station 2	Gas	4	3	1	207	Lateral		MA
Pittsfield Generating Co LP	Gas	1	1	0	183	Lateral		MA
Androscoggin Energy Center	Gas	3	3	0	165	Lateral		ME
Cleary Flood	Gas	2	1	1	132	Lateral		MA
A L Pierce	Gas	1	1	0	95	Lateral		CT
Dartmouth Power Associates	Gas	2	2	0	89	Lateral		MA
L Energia Facility	Gas	1	1	0	78	Lateral		MA
Windsor Locks	Gas	2	2	0	76	Lateral		CT
Waters River	Gas	2	2	0	62	Lateral		MA
Capitol District Energy Center	Gas	1	1	0	61	Lateral		CT
Pawtucket Power Associates	Gas	1	1	0	60	Lateral		RI
Lowell Cogeneration	Gas	1	1	0	32	Lateral		MA
Pratt & Whitney	Gas	1	1	0	31	Lateral		CT
Canal Plant	Oil	2	0	2	1,129	Lateral	<input checked="" type="checkbox"/>	MA

Middletown (CT)	Oil	8	1	7	984	Lateral	<input checked="" type="checkbox"/>	CT
Wyman Steam	Oil	4	0	4	822	Lateral		ME
Bridgeport Station	Oil	2	0	2	553	Lateral	<input checked="" type="checkbox"/>	CT
Montville Station	Oil	4	0	4	494	Lateral	<input checked="" type="checkbox"/>	CT
Merrimack	Oil	2	0	2	481	Lateral	<input checked="" type="checkbox"/>	NH
Newington Station	Oil	1	0	1	400	Lateral		NH
Devon	Oil	9	0	9	372	Lateral		CT
West Medway Station	Oil	3	0	3	186	Mainline		MA
Schiller	Oil	1	0	1	157	Lateral	<input checked="" type="checkbox"/>	NH
Cos Cob	Oil	5	0	5	117	Lateral		CT
Medical Area Total Energy Pla	Oil	10	4	6	86	Lateral		MA
Wilkins Station	Oil	2	0	2	78	Lateral		MA
Waterside Power	Oil	3	0	3	72	Lateral		CT
M Street Jet	Oil	1	0	1	67	Lateral		MA
Old Town Division	Gas	2	1	1	54	Lateral		ME
Berlin 5	Oil	1	0	1	50	Lateral		VT
Framingham	Oil	3	0	3	43	Lateral		MA
Cape Gas Turbine	Oil	2	0	2	41	Lateral		ME
Diesel Plant 1	Oil	1	0	1	24	Lateral		VT
Florence	Oil	1	0	1	23	Lateral		VT
White Lake	Oil	1	0	1	22	Lateral		NH
Gillette Co	Gas	6	3	3	21	Lateral		MA
Branford	Oil	1	0	1	21	Lateral		CT
Torrington	Oil	1	0	1	21	Lateral		CT
Doreen	Oil	1	0	1	21	Lateral		MA
Franklin Drive	Oil	1	0	1	21	Lateral		CT
Woodland Road	Oil	1	0	1	20	Lateral		MA
North Main Street	Oil	1	0	1	19	Lateral		CT
Lost Nation	Oil	1	0	1	18	Lateral		NH
Tunnel	Oil	1	0	1	16	Lateral		CT
Cherry Street	Oil	5	0	5	15	Lateral		MA
Shrewsbury	Oil	5	0	5	14	Lateral		MA
Central Power Plant	Oil	5	1	4	14	Lateral		RI

Colchester 16	Oil	1	0	1	14	Lateral	VT
Essex Junction 19	Oil	4	0	4	13	Lateral	VT
Rutland	Oil	1	0	1	13	Lateral	VT
Ascutney	Oil	1	0	1	13	Lateral	VT
Rumford Cogeneration	Oil	1	0	1	13	Lateral	ME
High St Station	Gas	10	7	3	12	Lateral	MA
Hampton (NH)	Oil	8	2	6	12	Lateral	NH
Matlack Road Microgrid	Oil	4	0	4	10	Lateral	CT
Velcro USA	Oil	5	1	4	10	Lateral	NH
Oak Bluffs Diesels	Oil	3	0	3	8	Lateral	MA
Burlington GT	Oil	2	0	2	8	Lateral	VT
Bristol Myers Squibb Wallingf	Oil	3	1	2	7	Lateral	CT
Nantucket	Oil	2	0	2	7	Lateral	MA
John Street	Oil	3	0	3	6	Lateral	CT
Norden Place	Oil	3	0	3	6	Lateral	CT
Vergennes 9	Oil	2	0	2	6	Lateral	VT
West Tisbury	Oil	2	0	2	6	Lateral	MA
CCSU Cogeneration Station	Gas	5	3	2	5	Lateral	CT
Gary Court	Oil	2	0	2	5	Lateral	CT
Norwalk WWTP	Oil	2	0	2	5	Lateral	CT
Norwich City	Oil	2	0	2	5	Lateral	CT
Deer Island Treatment Plant	Oil	2	0	2	5	Lateral	MA
Smith College Central Heating	Gas	2	1	1	5	Lateral	MA
West Charleston	Oil	2	0	2	3	Lateral	VT
Framingham State University	Oil	8	3	5	3	Lateral	MA
Plymouth State College Cogener	Oil	2	0	2	3	Lateral	NH
Eastport	Oil	3	0	3	3	Lateral	ME
Bar Harbor	Oil	2	0	2	2	Lateral	ME
Crotched MT Rehab Center	Oil	3	0	3	2	Lateral	NH
Norwich WWTP	Oil	1	0	1	2	Lateral	CT
Robbins Lumber Inc	Oil	1	0	1	2	Lateral	ME
Peaks Island Diesel	Oil	2	0	2	2	Lateral	ME
Middlebury College	Oil	3	0	3	2	Lateral	VT
Anderson Power Products Div	Oil	4	0	4	1	Lateral	MA

Hardwick	Oil	1	0	1	1	Lateral		VT
GE Co Aircraft Engines	Oil	1	0	1	0	Lateral		MA
Minturn	Oil	3	0	3	0	Lateral		ME
Portable	Oil	1	0	1	0	Lateral		ME
Lavalley Lumber LLC	Oil	1	0	1	0	Lateral		ME
Carbalon	Oil	1	0	1	0	Lateral		MA
Durgin & Crowell Lumber	Oil	1	0	1	0	Lateral		NH

# **EXHIBIT 27-24**

Clear River Energy Center - Burrillville, Rhode Island

Truck Trip Emissions

Initial Tank Fill Emissions Calculations

USER INPUT CELLS (BLUE= SELECT FROM DROPDOWN, ORANGE=ENTER MANUALLY)

Phase	Task	Duration (days)	Truck Type	Fuel	Trips per day	Route	Distance (mi)	Annual Pollutant Emissions (g)						
								VOC	THC	CO	NOx	PM2.5	PM10	CO2
Service/Fire Water Tank Initial Fill	Water	30	33,001-60,000 lb (e.g., long-haul semi-tractor trailer rigs)	Diesel	4.4	Water Truck Route	38.4	2294	2324	12075	46340	1084	1175	7341036
Demineralized Water Tank Initial Fill	Water	30	33,001-60,000 lb (e.g., long-haul semi-tractor trailer rigs)	Diesel	7.7	Water Truck Route	38.4	4040	4094	21268	81616	1909	2069	12929280
ULSD Distillate Oil Tank Initial Fill	Distillate Oil	30	33,001-60,000 lb (e.g., long-haul semi-tractor trailer rigs)	Diesel	6.7	Oil Truck Route	62.6	5697	5772	29985	115071	2692	2917	18229120
Aqueous Ammonia Tank Initial Fill	Aqueous Ammonia	30	33,001-60,000 lb (e.g., long-haul semi-tractor trailer rigs)	Diesel	0.1	Ammonia Route	56.6	112	114	590	2265	53	57	358881
Demin. Trailers for Water Treatment	Demin Trailers	30	33,001-60,000 lb (e.g., long-haul semi-tractor trailer rigs)	Diesel	0.1	Demin Trailer Route	60.6	43	43	224	859	20	22	136027
<b>Annual (grams)</b>								<b>12186</b>	<b>12346</b>	<b>64142</b>	<b>246152</b>	<b>5758</b>	<b>6240</b>	<b>38994343</b>
<b>Annual (Tons)</b>								<b>0.013</b>	<b>0.014</b>	<b>0.071</b>	<b>0.271</b>	<b>0.006</b>	<b>0.007</b>	<b>42.984</b>

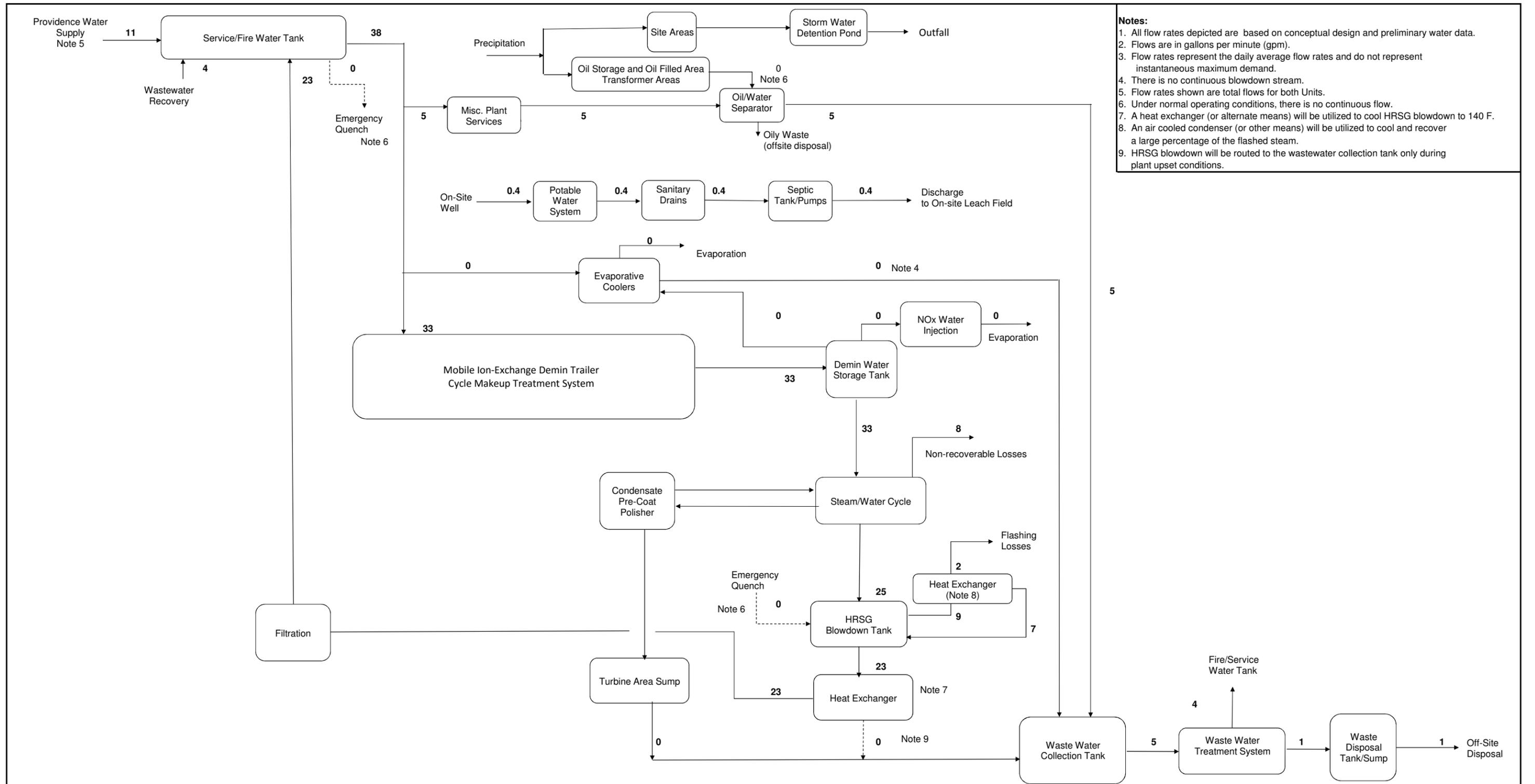
One Time - Initial Tank Fill Operation	Tank Volume, Gallons	Delivery Truck Volume, Gallons	Gallons of Water Treated per Demin Trailer	Truck Trips	Trucks Per Day
Service/Fire Water Tank	1,050,000	8,000		131.3	4.4
Demineralized Water Tank	1,850,000	8,000		231.3	7.7
ULSD Oil Tank	2,000,000	10,000		200.0	6.7
Aqueous Ammonia Tank	27,000	6,200		4.4	0.15
Demin. Trailers for Water Treatment			1,200,000	1.5	0.05
<b>Total Truck Trips</b>				<b>568.4</b>	

Duration in Days Not to Exceed a Total of 22 Trucks per Day  **Days** Trucks Per Day **18.9**

Assumptions

- 1 - Evaporative Cooling is assumed up to 8 hours per day
- 2 - It is assumed that the oil and water tanks are re-filled over a 25 day period (approximately one month) after a three day oil
- 3 - Evaporative cooling blowdown is recycled and not discharged as a process wastewater
- 4 - Ion Exchange Demineralizer Trailers produce 1.2 million gallons per trailer and evaporative cooler makeup is 50% demin and
- 5 - Water use increases as a result of evaporative cooler use

# **EXHIBIT 27-28**



- Notes:**
1. All flow rates depicted are based on conceptual design and preliminary water data.
  2. Flows are in gallons per minute (gpm).
  3. Flow rates represent the daily average flow rates and do not represent instantaneous maximum demand.
  4. There is no continuous blowdown stream.
  5. Flow rates shown are total flows for both Units.
  6. Under normal operating conditions, there is no continuous flow.
  7. A heat exchanger (or alternate means) will be utilized to cool HRSG blowdown to 140 F.
  8. An air cooled condenser (or other means) will be utilized to cool and recover a large percentage of the flashed steam.
  9. HRSG blowdown will be routed to the wastewater collection tank only during plant upset conditions.

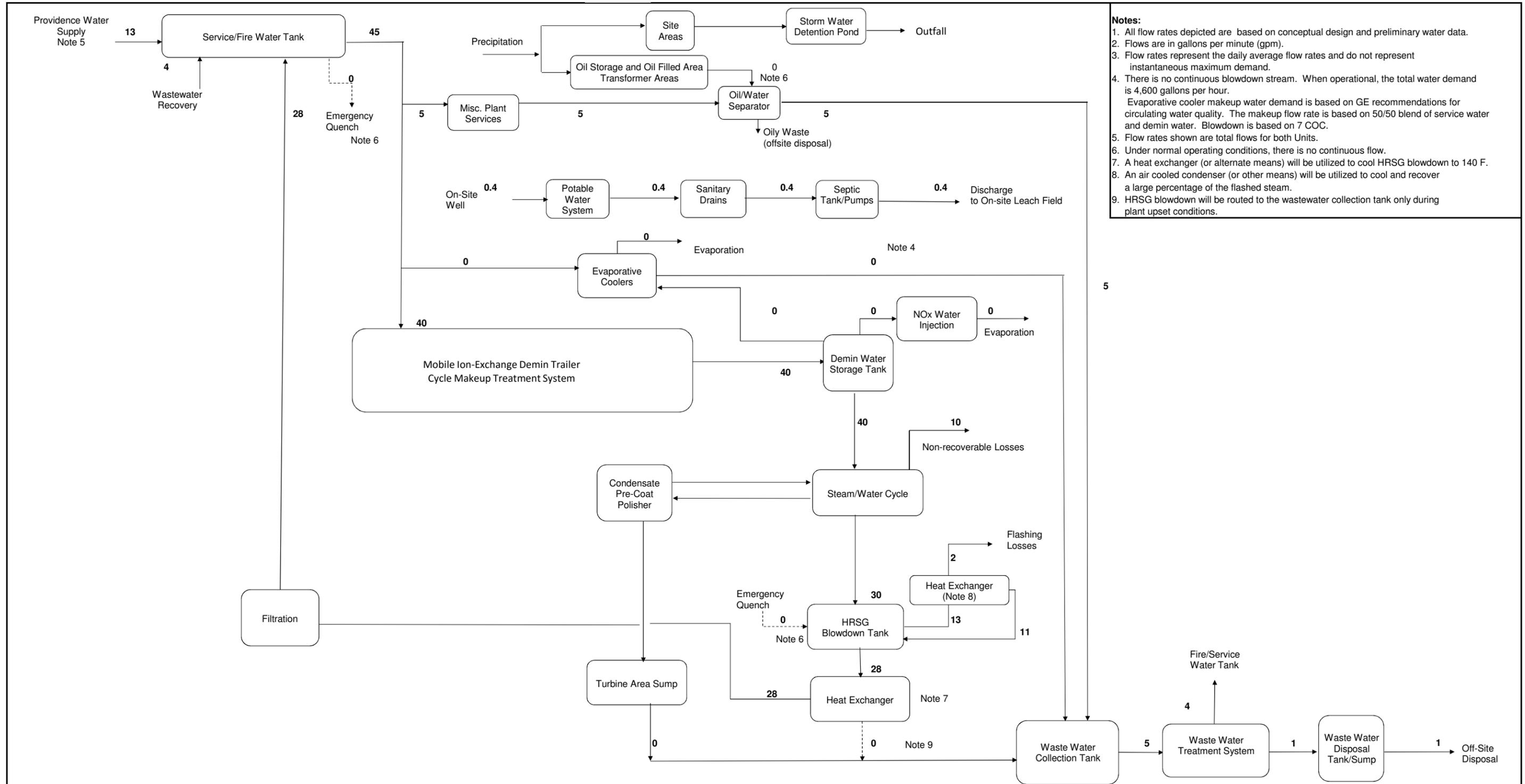
**FOR CONCEPTUAL DESIGN ONLY**



Conceptual Design Basis	07/10/2017	
Demin Water Makeup Demand	1.0% of IP+HP Steam Flow	GE HB Case 7 (Issued 3/31/2016)
Potable Water Demand	20 personnel, 50 gal per day, 3 shifts	
Ambient Conditions	51.8°F / 74%RH	
Fuel Oil Injection	None	



<b>RHODE ISLAND</b> <b>Two 1 x 1 COMBINED CYCLE</b>	Project 238926	Drawing WMB-01 SHEET 1-4
<b>NATURAL GAS FIRED WATER MASS BALANCE</b> Two 1 X 1 GE 7HA.02 - Dry Cooling Average Ambient Conditions - Full Load		Rev <b>N4</b>



- Notes:**
1. All flow rates depicted are based on conceptual design and preliminary water data.
  2. Flows are in gallons per minute (gpm).
  3. Flow rates represent the daily average flow rates and do not represent instantaneous maximum demand.
  4. There is no continuous blowdown stream. When operational, the total water demand is 4,600 gallons per hour. Evaporative cooler makeup water demand is based on GE recommendations for circulating water quality. The makeup flow rate is based on 50/50 blend of service water and demin water. Blowdown is based on 7 COC.
  5. Flow rates shown are total flows for both Units.
  6. Under normal operating conditions, there is no continuous flow.
  7. A heat exchanger (or alternate means) will be utilized to cool HRSG blowdown to 140 F.
  8. An air cooled condenser (or other means) will be utilized to cool and recover a large percentage of the flashed steam.
  9. HRSG blowdown will be routed to the wastewater collection tank only during plant upset conditions.



Conceptual Design Basis	07/10/2017	
Demin Water Makeup Demand	1.0% of IP+HP Steam Flow	GE HB Case 3 (Issued 3/31/2016)
Potable Water Demand	20 personnel, 50 gal per day, 3 shifts	
Ambient Conditions	90°F / 45%RH / Fired / Evap Cooler ON	
Fuel Oil Injection	None	

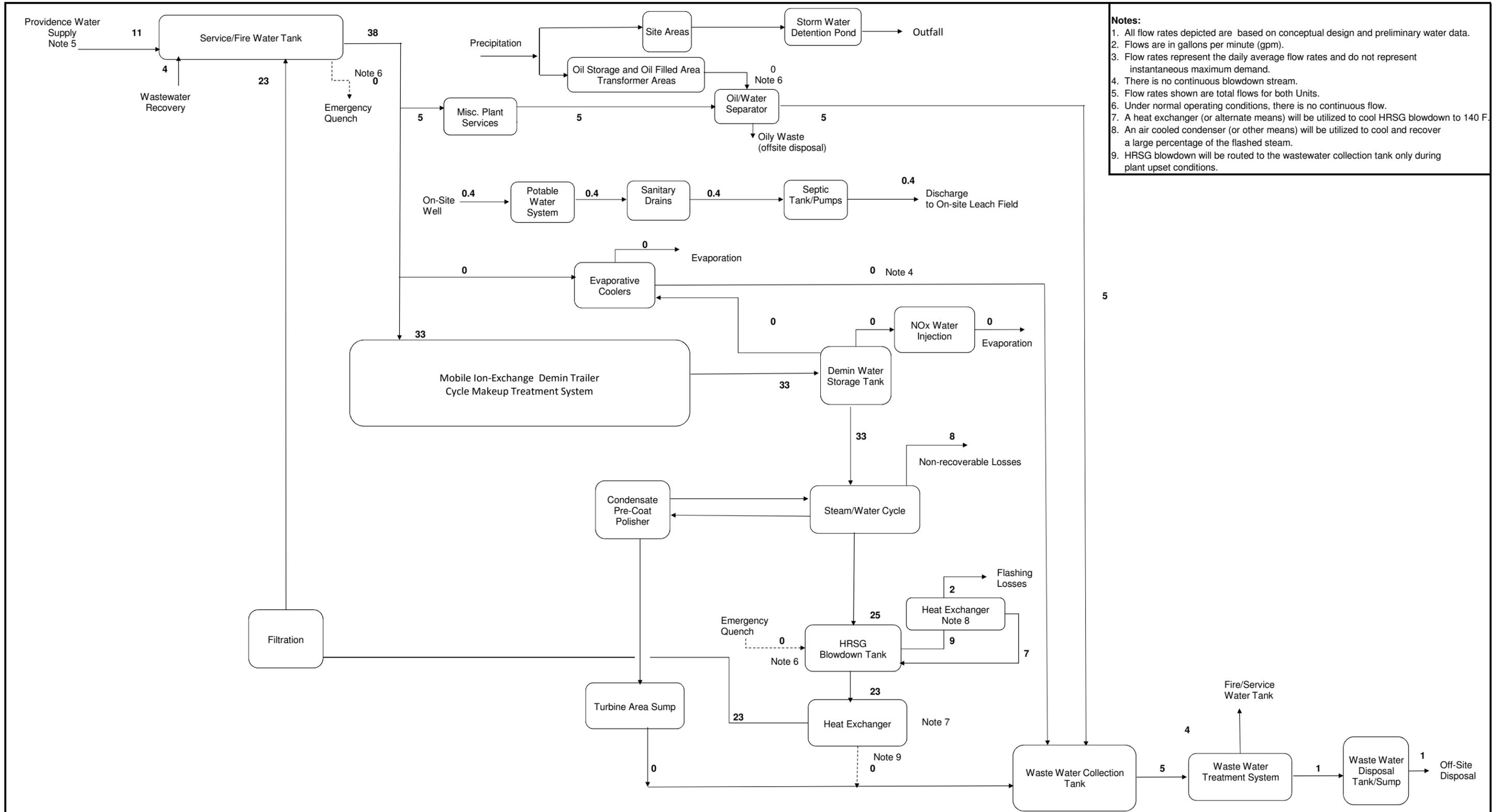


**RHODE ISLAND**  
**Two 1 x 1 COMBINED CYCLE**  
 NATURAL GAS FIRED WATER MASS BALANCE  
 Two 1 X 1 GE 7HA.02 - Dry Cooling  
 Summer Ambient Conditions - Full Load

Project  
 238926

Drawing  
 WMB-01  
 SHEET 2-4

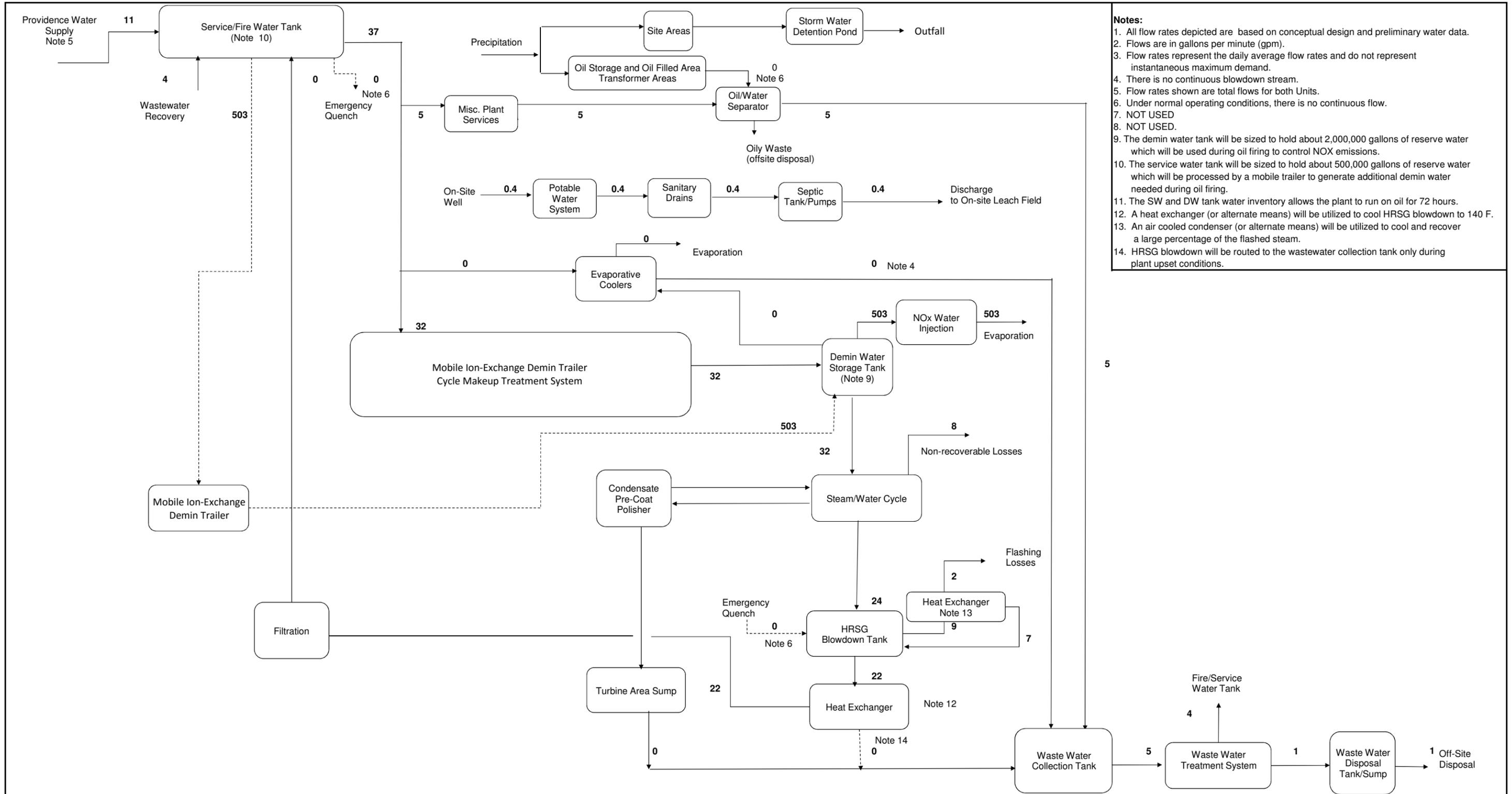
Rev  
 N4



- Notes:**
1. All flow rates depicted are based on conceptual design and preliminary water data.
  2. Flows are in gallons per minute (gpm).
  3. Flow rates represent the daily average flow rates and do not represent instantaneous maximum demand.
  4. There is no continuous blowdown stream.
  5. Flow rates shown are total flows for both Units.
  6. Under normal operating conditions, there is no continuous flow.
  7. A heat exchanger (or alternate means) will be utilized to cool HRSG blowdown to 140 F.
  8. An air cooled condenser (or other means) will be utilized to cool and recover a large percentage of the flashed steam.
  9. HRSG blowdown will be routed to the wastewater collection tank only during plant upset conditions.

**FOR CONCEPTUAL DESIGN ONLY**

	Conceptual Design Basis	07/10/2017		<b>RHODE ISLAND Two 1 x 1 COMBINED CYCLE</b>	Project	238926	Drawing	WMB-01 SHEET 3-4	
	Demin Water Makeup Demand	1.0% of IP+HP Steam Flow			GE HB Case 10 (Issued 3/31/2016)	NATURAL GAS FIRED WATER MASS BALANCE		Rev	
	Potable Water Demand	20 personnel, 50 gal per day, 3 shifts				Two 1 X 1 GE 7HA.02 - Dry Cooling			
	Ambient Conditions	20 °F / 60%RH				Winter Ambient Conditions - Full Load			N4
Fuel Oil Injection	None								



- Notes:**
1. All flow rates depicted are based on conceptual design and preliminary water data.
  2. Flows are in gallons per minute (gpm).
  3. Flow rates represent the daily average flow rates and do not represent instantaneous maximum demand.
  4. There is no continuous blowdown stream.
  5. Flow rates shown are total flows for both Units.
  6. Under normal operating conditions, there is no continuous flow.
  7. NOT USED.
  8. NOT USED.
  9. The demin water tank will be sized to hold about 2,000,000 gallons of reserve water which will be used during oil firing to control NOX emissions.
  10. The service water tank will be sized to hold about 500,000 gallons of reserve water which will be processed by a mobile trailer to generate additional demin water needed during oil firing.
  11. The SW and DW tank water inventory allows the plant to run on oil for 72 hours.
  12. A heat exchanger (or alternate means) will be utilized to cool HRSG blowdown to 140 F.
  13. An air cooled condenser (or alternate means) will be utilized to cool and recover a large percentage of the flashed steam.
  14. HRSG blowdown will be routed to the wastewater collection tank only during plant upset conditions.

**FOR CONCEPTUAL DESIGN ONLY**

	Conceptual Design Basis	07/10/2017		<b>RHODE ISLAND</b> <b>Two 1 x 1 COMBINED CYCLE</b> OIL (1 UNIT ONLY) FIRED WATER MASS BALANCE Two 1 X 1 GE 7HA.02 - Dry Cooling Winter Ambient Conditions - Full Load	Project	Drawing	
	Demin Water Makeup Demand	1.0% of IP+HP Steam Flow			GE HB Case 16 (Issued 3/31/2016)	238926	WMB-01 SHEET 4-4
	Potable Water Demand	20 personnel, 50 gal per day, 3 shifts					Rev
	Ambient Conditions	20 °F / 60%RH					N4
Fuel Oil Injection	Operational						