Public Service of New Hampshire

A Northeast Utilities Company

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William H. Smagula, P.E.
Vice President - Generation

February 27, 2014

D32795

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NEW HAMPSHIRE
FEB 27 2014
AIR RESOURCES DIVISION

Mr. Craig Wright, Acting Director
Air Resources Division
NH Dept. of Environmental Services
29 Hazen Drive, PO Box 95
Concord, NH 03302-0095

Re: Public Service Company of New Hampshire Schiller Station – Temporary Permit Application for Installation of Dry Sorbent and Activated Carbon Injection Emission Control Technology

Dear Mr. Wright:

Public Service Company of New Hampshire (PSNH) submits the enclosed temporary permit application for the installation of dry sorbent (DSI) and activated carbon injection (ACI) emission control technologies on Schiller Station Units SR4 and SR6. The installation of the DSI/ACI systems will be used in conjunction with existing control technologies to meet the requirements of *40 CFR 63, Subpart UUUUU, and National Emission Standards for Hazardous Air Pollutant: Coal and Oil Fired Electric Utility Steam Generating Units* (Mercury and Air Toxics Standard-MATS). The proposed DSI and ACI systems are intended to reduce the emissions of acid gases (hydrogen chloride and hydrogen fluoride) and mercury, and are anticipated to also reduce emissions of sulfur dioxide and sulfuric acid mist.

The DSI/ACI system installation project is a multi-year, multi-component project with start-up and commissioning of the new system expected to occur during the first quarter of 2016. The new DSI/ACI system involves the construction and installation of a carbon bulk bag unloading system, a dry sorbent storage silo, sorbent feed equipment, and injection lances located in the ductwork of Units SR4 and SR6 to supply sorbent and activated carbon directly into the flue gas stream. Conceptual drawings for both injection systems are attached.

The preliminary project schedule includes the following project milestones and anticipated target dates.

Project Milestones	Anticipated Target Dates
Solicitation of Bids for Owners Engineer	January-February 2014
Award of Owners Engineer Contract	March 2014
Development of DSI/ACI System Specification	March – May 2014
Solicitation of Bids for DSI/ACI System	May - June 2014
Award of DSI/ACI System Contract	June 2014
Preliminary System Engineering	June – November 2014
Development of System Installation Specification	August – November 2014
Solicitation of Bids for System Installation	December – January 2015
Award of System Install Contract	January 2015
Completion of Construction	December 2015
Start-up, Commissioning and Performance Testing	January – April 2016

I expect that a more defined schedule will be developed by mid-2014 once the system contract is awarded. Updates to the schedule will be provided to DES as necessary during the completion of the DSI/ACI system.

If you have any questions regarding the enclosed application, please contact Sheila Burke of my staff at 603-634-2512.

Very truly yours,

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

William H. Smagula

William H. Smagula, P.E.
Vice President – PSNH Generation

Att.

ATTACHMENTS

FILE REFERENCE NOTATION

Confidential Business Information received on 2/27/14 with application # 14-0081.
PSNH – Schiller Station AFS # 3301500012. Filed in VII. A. Confidential Business Information.

FILE REFERENCE NOTATION

Confidential Business Information received on 2/27/14 with application # 14-0081.
PSNH – Schiller Station AFS # 3301500012. Filed in VII. A. Confidential Business Information.

AIR PERMIT APPLICATION FOR DRY SORBENT AND ACTIVATED CARBON INJECTION UNITS SR4 AND SR6

SCHILLER STATION
PORTSMOUTH, NEW HAMPSHIRE

PREPARED FOR:
Public Service Company of New Hampshire
Manchester, New Hampshire

PREPARED BY:
GZA GeoEnvironmental, Inc.
Manchester, New Hampshire

February 2014
File No. 04.0029995.00

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Public Service Company of New Hampshire (PSNH) Schiller Station (Schiller) is a wood and fossil fuel-fired electric generating station. Schiller Units 4 (SR4) and 6 (SR6) consist of two fossil fuel-fired electric utility steam generating units permitted to combust coal and oil, with biomass co-firing capacity of up to 10 percent (%) by weight of coal input. The facility also includes one wood and fossil fuel-fired boiler (SR5), a combustion turbine (SRCT), emergency generator, a primary and secondary coal crusher, coal and wood handling systems and various insignificant and exempt activities.

PSNH is proposing to install Dry Sorbent Injection (DSI) and Activated Carbon Injection (ACI) systems on SR4 & SR6 for the purposes of complying with the emissions limitations established under 40 CFR Part 63, Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units. DSI/ACI systems are used to control a variety of air emissions such as hydrochloric acid (HCl), mercury, and sulfur dioxide (SO_2) from the flue gas stream. PSNH is proposing to configure the DSI/ACI systems to be compatible with various sorbents including trona (trisodium hydrogendicarbonate dehydrate), sodium bicarbonate and activated carbon. These sorbents will be injected into the flue gas stream through strategically located ports upstream of the electrostatic precipitator (ESP). These sorbents are formulated to react with and/or adsorb constituents from the flue gas, the reaction products and sorbents are then removed downstream by the ESP. Application forms (Form ARD-1 and two Form ARD-2s) are provided in **Appendix A.** Proof of good standing is provided in **Appendix D.**

The sorbent injection systems are self-contained and designed for maximum operational flexibility, accuracy and consist of three major components (sorbent injection control units, sorbent storage units and ancillary equipment).

1.1.1 Sorbent Injection Control

The injection control units are used to control the overall processes and are designed to inject sorbent material into the flue gas stream. The sorbents will enter the flue gas stream through strategically located lances. The systems will be configured to achieve optimum reduction of mercury and acid gas emissions from the coal combustion process. Activated carbon will be used for mercury control, while sodium bicarbonate and trona will be utilized for acid gas control. Safety data sheet information for each proposed sorbent material is provided in **Appendix B**.

1.1.2 Sorbent Storage and Delivery Units

The storage and delivery units serve as the local final storage and feed system for the sorbent injection systems and serve as the metering platform to deliver sorbents to the flue gas. A storage unit consisting of a vertical silo will be used store sodium bicarbonate and/or trona. Activated carbon will be received in bulk storage bags, which will be used to directly supply the ACI systems.

1.1.3 Ancillary Equipment

Ancillary equipment includes the remaining equipment needed to operate the systems, including hoses and manifolds needed to convey the various sorbent materials to the injection ports.

1.2 DESCRIPTION OF SCHILLER SR4 AND SR6

Schiller SR4 and SR6 are front-wall fired, dry bottom, pulverized coal steam electric boilers, each capable of providing 50 megawatts gross electrical output. These units are also capable of firing oil and co-firing biomass with coal. Each unit has a heat input rating of 574 million British thermal units per hour (MMBTU/hr) when firing coal, which corresponds to a maximum fuel consumption rate of 22.51 tons per hour at 12,750 British thermal units per pound (BTU/lb). Each unit is equipped with electrostatic precipitators (ESPs) for particulate matter (PM) control and selective non-catalytic reduction (SNCR), overfire air systems, and low-NO_X burners to control oxides of nitrogen (NO_X). Each boiler is equipped with a continuous emissions monitoring system (CEMS) to monitor gas flow rate, opacity, carbon dioxide (CO_2), sulfur dioxide (SO_2), and NO_X. Each boiler is also equipped with continuous carbon monoxide (CO) monitoring; however these units are not currently maintained for compliance purposes as CEMS.

2.0 EMISSIONS DATA

2.1 BOILER EMISSIONS

It is not anticipated that the installation of the DSI/ACI system will have a material effect on combustion conditions, ash handling, or the operation of the air pollution control equipment in SR4 and SR6. The proposed DSI/ACI installation will result in reduced emissions of acid mist, acid gases (HCL and hydrogen fluoride), mercury, and SO_2 from SR4 and SR6. Although the proposed dry sorbent materials that will be injected into the flue gas stream represent additional particulate matter loading to the ESPs, research and development trials conducted in August of 2012 and August of 2013 indicate that the sorbents are readily removed by the ESPs, and no increase in PM emissions is anticipated to occur. A summary of the emissions data generated during the R&D trial runs is included in **Appendix B**.

Hourly and annual emissions data for SR4 and SR6 are presented in **Tables 1** and **2**, and estimated Hazardous Air Pollutant (HAP) emission summaries for SR4 and SR6 are presented in **Tables 3** and **4**.

3.0 APPLICABLE REQUIREMENTS

The applicability of various State and federal regulations are discussed below.

3.1 NON-ATTAINMENT NEW SOURCE REVIEW AND PREVENTION OF SIGNIFICANT DETERIORATION

Schiller Station is a major source of SO_2, NO_X, PM, CO, CO_2, VOC and HAP. Schiller is located in Rockingham County which is listed as attainment/unclassifiable for ozone. However, the

entire State of New Hampshire is part of the Northeast Ozone Transport Region, and the NOX/VOC significance thresholds applicable to moderate ozone non-attainment areas apply. Therefore, if a net emissions increase of NO_X and/or VOC from the proposed installation to SR4 and SR6, including any contemporaneous increases and decreases, exceeds the significance level of 40 tons per year for either pollutant, then non-attainment new source review (NSR) applies.

The facility is located in areas classified as attainment/unclassifiable for CO, NO_2, PM_{10}, $PM_{2.5}$, lead, and SO_2. The facility is a major source of one or more attainment pollutants, and, therefore, a significant net emissions increase of an attainment pollutant is subject to the Prevention of Significant Deterioration (PSD) permitting requirements for that particular pollutant.

A physical change or change in the method of operation that results in a significant net emissions increase of an attainment or non-attainment pollutant would be subject to PSD and non-attainment NSR permitting requirements, respectively. For an electric utility steam generating unit (ESGU), the evaluation of the net emissions increases is based on the projected representative actual annual emissions for a two-year period after a physical change or change in the method of operation, considering the effect that the change has on increasing or decreasing the hourly emissions rate and on the projected capacity utilization of the unit. Changes in capacity utilization that are unrelated to the particular change in the unit are excluded for the purposes of determining the representative actual annual emissions (40 CFR 52.21(33), July 1, 1993).

A significant net increase is determined by comparing the representative actual annual emissions (actual emissions) prior to the change to the projected future actual emissions expected to occur after the change (actual-to-actual test). If this test demonstrates that any emissions increases resulting from the change are less than the significance levels established in the NSR rules, NSR does not apply. The actual-to-actual test is generally preferred because it allows emissions increases that result from demand growth to be excluded from the demonstration provided that the unit could accommodate such growth prior to the change. This demand growth exclusion is particularly important for ESGUs since very small fluctuations in demand (<1%) can result in pollutant increases that would otherwise trigger NSR.

No significant net increases in emissions are expected to occur as a result of the proposed DSI system installation. In addition, the DSI system will not affect the capacity utilization or increase the dispatch status of SR4 and SR6 with the Independent System Operator. Therefore, there will not be a significant net increase in representative actual annual emissions as a result of the proposed change, and PSD and NSR permitting requirements will not apply.

Actual emissions for an ESGU are defined as the average rate, in tons-per-year, at which the unit actually emitted the pollutant during a two-year period which precedes the proposed change and which is representative of normal source operation. Projected actual emissions are the projected annual emissions from each modified unit for the two-year period after the proposed change (or another two-year period that is more representative of normal operation of the modified unit).

Based on an evaluation of utilization over the most recent five year period, calendar years 2009 and 2010 were selected as most representative of normal operation for SR4 and SR6. Emissions data for calendar years 2009 through 2013 are provided in **Appendix B**, along with pertinent sample calculations and supporting documentation.

The non-attainment NSR and PSD applicability analysis for the proposed DSI system is presented in **Table 5**. Based on the information presented in **Table 5**, the proposed installation to SR4 and SR6 are not subject to PSD or non-attainment NSR permitting requirements.

3.2 40 CFR 60 SUBPART DA – STANDARDS OF PERFORMANCE FOR ELECTRIC UTILITY STEAM GENERATING UNITS

Schiller SR4 and SR6 are electric utility steam generating units for the purposes of New Source Performance Standards at 40 CFR 60. Although they were installed prior to the applicability date, any change at these units that would be considered a modification under 40 CFR 60, namely an increase in the maximum hourly emission rate of a pollutant regulated under the particular subpart, would be considered a modification, subjecting these units to the requirements of 40 CFR 60 Subpart Da. However, the proposed changes will not increase the maximum hourly emission rate of any pollutants regulated under Subpart Da. It is not anticipated that an annual or hourly emission increase will result from this proposed change. 40 CFR 60, Subpart Da applies to each electric utility steam generating unit that commences construction, reconstruction or modification after 1978, and has a heat input greater 250 MMBtu. Unit 4 was constructed in 1952 and has a heat input capacity of 574 MMBtu/hr. Unit 6 was constructed in 1957 and also has a heat input capacity of 574 MMBtu/hr.

Under 40 CFR 60, modification means *"any physical changing in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standards applies" emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted."* A physical or operation change to an existing facility which results in an increase in the emission rate (lb/hr) to the atmosphere of any pollutant to which a standard applies is considered a modification. Subpart Da establishes standards for NOx, SO_2, and TSP. The proposed changes to SR4 and SR6 will not result in an increase in the potential hourly emission rate of any regulated pollutants under Subpart Da; therefore, the proposed changes do not constitute a modification under 40 CFR 60 NSPS.

Reconstruction means "*the replacement of components of an existing facility to such an extent that (1) the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and (2) It is technologically and economically feasible to meet the applicable standards.*" The proposed installation of the DSI systems for SR4 and SR6 are well below this threshold and, therefore, the proposed changes do not constitute reconstruction under 40 CFR 60.

3.3 40 CFR 63 SUBPART UUUUU – NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS: COAL- AND OIL-FIRED ELECTRIC UTILITY STEAM GENERATING UNITS

Schiller Station is a major source of HAPs. Three coal- and/or oil-fired ESGUs are in operation at the Site (i.e., Units SR4, SR5, and SR6). Unit SR5 currently combusts biomass fuel, with the permitted capacity to combust coal. SR5 operates under a case-by-case MACT determination under 40 CFR 63, Subpart B. Units SR4 and SR6 are subject to the emission standards for coal-fired ESGUs under Subpart UUUUU. Each unit was designed to combust virgin coal with a heat content of greater than 8,300 BTU per pound. Therefore, the standards applicable to coal-fired units in the "not low-rank coal" category listed in Table 2 of Subpart UUUUU apply to SR4 and SR6.

PSNH intends to comply with the following emissions limits under the rule:

Filterable PM – 0.03 lb/MMBTU, 30-day average
HCl – 0.002 lb/MMBTU, 30-day average
Mercury – 1.2 lb/trillion BTU, 30-day average

In addition to the emissions limitations outlined above, PSNH is also subject to the following provisions of Subpart UUUUU:

- Work practice standards including periodic burner and combustion control tune ups and startup and shutdown requirements.
- Operating limits.
- Performance testing.
- Demonstrating continuous compliance.
- Notification, recordkeeping and reporting, including semi-annual compliance reporting.

PSNH is currently in the process of evaluating and selecting alternatives for performance testing and continuous compliance monitoring under Subpart UUUUU. PSNH anticipates that final alternatives will be selected as part of the system design and procurement process. PSNH will provide updated compliance documentation to NHDES once available.

The compliance date for existing EGUs under Subpart UUUUU is April 16, 2015. In accordance with the provisions of 40 CFR 63.6(i), PSNH has requested and been granted a one-year extension until April 16, 2016. Various notifications are required under Subpart UUUUU and will be submitted in accordance with the schedules established in the rule.

3.4 CHAPTER ENV-A 600

Chapter Env-A 600 requires that a permit be obtained for certain air pollution sources. This includes the proposed installation. Env-A 606, Air Pollution Dispersion Modeling Impact Analysis, requires that a complete modeling impact analysis be performed as part of an application for a permit. Criteria pollutant emissions are not anticipated to increase due to the proposed installation and therefore, modeling will not be required. The trona sorbent material contains crystalline silica as an impurity. Crystalline silica is a regulated toxic air pollutant under Env-A 1400. Air quality dispersion modeling was previously prepared and submitted to NHDES in support of the DSI research and development trails. A revised and updated Env-A 1400 compliance evaluation based on the installation of DSI systems on SR4 and SR6 has been included with this application as **Appendix C**. Env-A 618 requires that major modifications to existing sources demonstrate that net emissions increases are not significant. Env-A 619 requires that major modifications comply with PSD requirements of 40 CFR 52.21. A discussion of NSR and PSD applicability is presented in **Section 3.1** above, and **Table 5** presents a comparison of the net emissions increases with the significant emission values defined in Env-A 618.02(b)(11) and 40 CFR 52.21.

3.5 CHAPTER ENV-A 1300

Chapter Env-A 1300 contains Reasonably Available Control Technology (RACT) NO_X emission limits for various combustion devices at facilities with potential annual NO_X emissions of 50 tons or greater. Schiller Station exceeds this threshold and, therefore, the proposed installation is subject to NO_X RACT. Under Env-A 1300, SR4 and SR6 are utility boilers with a heat input rating greater than 50 MMBTU/hr firing coal, coal/biomass and/or No. 6 oil. Therefore, the

boilers are subject to Env-A 1303.06(b), which requires a 24-hour average emissions limit of 0.50 lb/MMBTU when firing coal or any combination of coal and oil. The boilers are equipped with overfire air and SNCR systems, and the NO_X emissions levels of the modified boilers will also comply with the applicable limit when firing coal or any combination of coal, biomass and oil.

3.6 CHAPTER ENV-A 1400

The proposed installation and operation of the proposed SR4 and SR6 DSI systems is anticipated to result in emissions of Env-A 1400 regulated toxic air pollutants due to the presence of crystalline silica as an impurity in one of the proposed sorbents (trona). An Env-A 1400 air toxics compliance demonstration has been prepared for SR4 and SR6 and is provided as **Appendix C** to document that installation and operation of the proposed DSI systems will not result in exceedances of the applicable Env-A 1400 ambient air limits (AALs).

3.7 CHAPTER ENV-A 1600

Chapter Env-A 1600 contains fuel specifications for combustion sources, including sulfur limitations for solid, liquid, and gaseous fuels. Coal and fuel oil are listed fuels, and, therefore, the modification is subject to Env-A 1600. The existing fuel sulfur limitations for SR4 and SR6 are equal to or lower than the limits established in Env-A 1600.

3.8 CHAPTER ENV-A 2000

Chapter Env-A 2000 contains general requirements and standards for fuel burning devices. In accordance with Env-A 2002.01, opacity is limited to 40% for any continuous 6-minute period in any 60-minute period for any fuel burning device installed prior to May 13, 1970.

In accordance with Env-A 2002.06(c)(2), particulate matter emissions from the proposed DSI installation are limited to 0.31 lb/MMBTU. Each unit is currently limited by permit condition to 0.10 lb/MMBTU. Filterable particulate matter emissions are further limited to 0.03 lb/MMBTU (30-day average) under 40 CFR Subpart UUUUU.

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TABLES

TABLE 2
ESTIMATED EMISSIONS FROM VARIOUS FUELS

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	Actual Hourly Emissions Basis	Potential Hourly Emissions Basis	Potential Annual Emissions	Average Hourly Emissions (lb/hr)		Potential Hourly Emissions (lb/hr)		Potential Annual Emissions (tons/yr)	
				Unit 4	Unit 6	Unit 4	Unit 6	Unit 4	Unit 6
Coal									
NO_X	0.28 lb/MMBTU	0.50 lb/MMBTU	0.46 lb/MMBTU	159.60	159.60	287.00	287.00	1156.50	1156.50
CO	0.5 lb/ton	0.5 lb/ton	0.5 lb/ton	11.25	11.25	11.25	11.25	49.30	49.30
PM	Test Data	0.1 lb/MMBTU	0.030 lb/MMBTU	11.48	11.48	57.40	57.40	75.56	75.56
PM_{10}	67% PM	67% PM	67% PM	7.69	7.69	38.46	38.46	50.62	50.62
$PM_{2.5}$	29% PM	29% PM	29% PM	3.33	3.33	16.65	16.65	21.91	21.91
SO_2	1.13 lb SO2/MMBTU	2.40 lb SO2/MMBTU	2.40 lb SO2/MMBTU	649.95	649.95	1377.60	1377.60	6033.89	6033.89
VOC	0.06 lb/ton	0.06 lb/ton	0.06 lb/ton	1.35	1.35	1.35	1.35	5.92	5.92
Coal / Biomass									
NO_X	0.28 lb/MMBTU	0.50 lb/MMBTU	0.46 lb/MMBTU	159.35	159.35	287.00	287.00	1156.50	1156.50
CO	0.5 lb/ton	0.5 lb/ton	0.5 lb/ton	11.25	11.25	11.25	11.25	49.30	49.30
PM	Test Data	0.1 lb/MMBTU	0.030 lb/MMBTU	11.48	11.48	57.40	57.40	75.56	75.56
PM_{10}	67% PM	67% PM	67% PM	7.69	7.69	38.46	38.46	50.62	50.62
$PM_{2.5}$	29% PM	29% PM	29% PM	3.33	3.33	16.65	16.65	21.91	21.91
SO_2	1.13 lb SO2/MMBTU	2.40 lb SO2/MMBTU	2.40 lb SO2/MMBTU	649.95	649.95	1377.60	1377.60	6033.89	6033.89
VOC	0.06 lb/ton	0.06 lb/ton	0.06 lb/ton	34.44	34.44	34.44	34.44	150.85	150.85
Number 6 Fuel Oil									
NO_X	0.26 lb/MMBTU	0.50 lb/MMBTU	0.46 lb/MMBTU	149.70	149.70	287.50	287.50	1158.51	1158.51
CO	5.00 lb/Mgal	5.00 lb/Mgal	5.00 lb/Mgal	19.17	19.17	19.17	19.17	83.95	83.95
PM	Test Data	0.1 lb/MMBTU	0.030 lb/MMBTU	11.50	11.50	57.40	57.40	75.56	75.56
PM_{10}	63% PM	63% PM	63% PM	7.25	7.25	36.16	36.16	47.60	47.60
$PM_{2.5}$	41% PM	41% PM	41% PM	4.72	4.72	23.53	23.53	30.98	30.98
SO_2	155.08 lb/Mgal	314.00 lb/Mgal	314.00 lb/Mgal	594.48	594.48	1203.67	1203.67	5272.06	5272.06
VOC	0.76 lb/Mgal	0.76 lb/Mgal	0.76 lb/Mgal	2.91	2.91	2.91	2.91	12.76	12.76

Notes:
1. With the exception of filterable PM, the emissions basis for coal and No. 6 fuel estimated based on actual average emissions from 2009 and 2010.
2. Filterable PM emissions were estimated based upon the Subpart UUUUU emission limit of 0.03 lb/MMBTU.
3. Potential emissions are estimated based on 574 MMBTU/hr for coal and 575 MMBTU/hr for oil, for each boiler and 8,760 operating hours per year.
4. Maximum hourly emissions of NO_X, SO_2 and PM are limited by permit to 0.5 lb/MMBTU, 2.4 lb/MMBTU and 0.1 lb/MMBTU, respectively. Maximum emissions of NO_X is also limited by permit to an annual average of 0.46 lb/MMBTU.
5. Potential emission of CO and VOC from coal combustion are estimated based on AP-42 emission factors.
6. Potential emissions for CO and VOC from oil combustion are estimated based on AP-42 emission factors.

TABLE 3
SELECT ESTIMATED EMISSIONS FROM COAL COMBUSTION

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Unit	SR4,SR6 Coal
PM10 Control Efficiency	98.9%
Proportion of Ash That is Fly ash	98%
Heat Value (MMBTU/ton)	25.50

Pollutant [4]	SR4, SR6 Coal Concentration[1] (ppm)	SR4, SR6 Emission Factor [2,3] (lb/ton)
Antimony	1	2.16E-05
Arsenic	10.6	2.29E-04
Beryllium	1.26	2.72E-05
Cadmium	0.525	1.13E-05
Cobalt	6.49	1.40E-04
Chromium	18.6	4.01E-04
Lead	8.1	1.75E-04
Manganese	23.7	5.11E-04
Mercury [5]	0.0226	3.06E-02
Nickel	16	3.45E-04
Selenium	3.2	6.90E-05
Hydrogen Chloride (chlorine)[6,7]	319	5.10E-02
Hydrogen Fluoride (fluorine)[6,8]	65	5.48E-02

Notes:
1. Coal concentration data is from EPRI fuel database.
2. Emission factor assumes all metals in the coal (except mercury) are transferred to the ash and that fly ash comprises 98% of all ash.
3. Sample calculation: Coal combusted (tons) x 2000 (lb/ton) x concentration (ppm) / (1,000,000) x 98% fly ash proportion x (1 - control efficiency).
4. Metal compounds are expressed as the parent metal.
5. Mercury emission factor for SR4 and SR6 calculated is based on the Subpart UUUUU emission limit of 1.2 lb/trillion BTU.
6. Acid gas emissions were calculated assuming all of the chloride and fluoride is converted to hydrogen fluoride and hydrogen chloride, respectively.
7. Hydrogen chloride emission factor is based on the Subpart UUUUU emission limit of 0.002 lb/MMBTU.
8. An estimated DSI control efficiency of 60% was applied to the hydrogen fluoride emission factor.

TABLE I
CRITERIA POLLUTANT INVENTORY

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	SR4 (biomass)		SR6 (biomass)		SR4 (coal)		SR6 (coal)		SR4 (oil)		SR6 (oil)		SR4 (Gas)		SR6 (Gas)		SR 4 Totals		SR 6 Totals	
	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions[4] (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions[4] (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)
Fuel Use:	180 tons	19,719 tons	180 tons	19,719 tons	122,463 tons	197,188 tons	114,661 tons	197,188 tons	321,396 gal	33,579,971 gal	238,980 gal	33,579,971 gal	0.18 MMscf	0 MMscf	0.20 MMscf	0 MMscf				
SO_2	0.03	3.70	0.03	3.70	1712.36	6033.89	1645.83	6033.89	24.92	5272.06	18.53	5272.06	0.00005	-	0.00006	-	1,737.32	6,033.89	1,664.43	6,033.89
NO_x	0.30	32.54	0.30	32.54	415.67	1156.50	406.61	1156.50	6.43	1158.51	4.78	1158.51	0.012	-	0.01	-	422.40	1,158.51	411.99	1,158.51
PM	0.07	4.44	0.07	4.44	30.62	75.42	31.47	75.42	0.016	75.56	0.012	75.56	0.0002	-	0.0002	-	30.71	75.56	31.62	75.56
PM_{10}	0.05	5.92	0.05	5.92	20.51	50.53	21.08	50.53	0.010	47.60	0.008	47.60	0.0002	-	0.0002	-	20.58	50.53	21.20	50.53
$PM_{2.5}$	0.05	5.03	0.05	5.03	8.88	21.87	9.12	21.87	0.007	30.98	0.005	30.98	0.0002	-	0.0002	-	8.93	30.98	9.22	30.98
Condensable P M	0.02	2.51	0.02	2.51	54.77	341.29	51.28	341.29	0.24	25.18	0.18	25.18	0.0005	-	0.0006	-	55.03	341.29	51.51	341.29
CO	0.81	88.73	0.81	88.73	30.62	49.30	28.67	49.30	0.80	83.95	0.60	83.95	0.007	-	0.009	-	32.23	88.73	30.89	88.73
VOC	0.023	2.51	0.023	2.51	3.67	5.92	3.44	5.92	0.12	12.76	0.09	12.76	0.0005	-	0.0006	-	3.82	12.76	3.58	12.76

Fuel Type	Emission Factors									
	SO_2	NO_X	CO	VOC	PM	PM10	PM2.5	Condensable PM	Heat Content	AP-42 Citations
Biomass	0.025 (lb/mmbtu)	0.22 (lb/mmbtu)	0.6 (lb/mmbtu)	0.017 (lb/mmbtu)	0.054 (lb/mmbtu)	0.04 (lb/mmbtu)	0.034 (lb/mmbtu)	0.017 (lb/mmbtu)	15 mmbtu/ton	Table 1.6-1 and 1.6-3
Coal	Site Data	Site Data	0.5 lb/ton	0.06 lb/ton	See Note 2	67% PM	29% PM	0.1S-0.03 (lb/mmbtu)	25.5 mmbtu/ton	Tables 1.1-5, 1.1-6, 1.1-19, and onsite data
Oil	157S lb/1,000 gal	40 lb/1000 gal	5 lb/1000 gal	0.76 lb/1000 gal	0.1 lb/1,000 gal	63% PM	41% PM	1.5 lb/1,000 gal	153.8 mmbtu/1,000 gal	Tables 1.3-1, 1.3-2, 1.3-4 and onsite data
Gas	0.6 lb/mmscf	140 lb/mmscf	84 lb/mmscf	5.5 lb/mmscf	1.9 lb/mmscf	1.9 lb/mmscf	1.9 lb/mmscf	5.7 lb/mmscf	N/A	Tables 1.4-1 and 1.4-2

Notes:

1. S = percent sulfur of the fuel. The actual average sulfur content of the #6 fuel combusted in 2009/2010 was 0.988%, therefore 0.988 was used as S in the calculations.
2. Actual emissions are based on the average of 2009 and 2010 actual emissions.
3. Actual emissions of NOx and SO2 from SR4 and SR6 are based on continuous monitoring data. Emissions of VOC and CO from SR4 and SR6 were estimated based on AP42 emission factors.
4. Natural gas is used for boiler ignition and is not a primary fuel for SR4 and SR6.
5. Actual PM emissions for SR4 (coal) and SR6 (coal) are based on unit specific emission factors derived from stack testing as reported to NH DES.
   SR4 (actual coal) = 0.02 lb PM / MMBTU, SR6 (actual coal) = 0.02 lb PM/MMBTU
6. The ESP Efficiency of 99.2% for SR4 and SR6 was derived from stack testing data.
7. Potential PM emissions for SR4 and SR6 are based on the Subpart UUUU Filterable PM emission limit of 0.03 lb/MMBTU
8. PM, PM10 and PM2.5 emissions represent the filterable fraction for each particle size range.
9. Actual condensable particulate matter emissions for coal combustion in SR4 and SR6 were estimated based upon an average coal sulfur content of 0.658 percent and 12,501 BTU per pound of coal
10. Potential condensable particulate matter emissions for coal combustion in SR4 and SR6 were based upon an average coal sulfur content of 1.3 pounds of sulfur/MMBTU (1.66 %) and 12,750 BTU per pound of coal
11. An estimated heat content of 7500 BTU per pound (15 mmBTU/ton) was used for dry biomass combustion in SR4 and SR6.

TABLE 4
SUMMARY OF HAZARDOUS AIR POLLUTANT EMISSIONS

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	SR4, SR6 Coal Emission Factor (lb/ton)	SR4, SR6 Biomass Emission Factor (lb/MMBTU)	SR4 and SR6 Oil Emission Factor (lb/1000 gal)	SR4 (biomass)		SR6 (biomass)		SR4 (coal)		SR6 (coal)		SR4 (oil)		SR6 (oil)		SR4 (Gas)		SR6 (Gas)		Totals	
				Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)
Fuel Use:				180 tons	19,719 tons	180 tons	19,719 tons	122,463 tons	197,188 tons	114,661 tons	197,188 tons	321,396 gal	33,579,971 gal	238,980 gal	33,579,971 gal	0.18 MMscf	0.00 MMscf	0.20 MMscf	0.00 MMscf		
2,3,7,8-TCDD	1.43E-11	8.60E-12	-	1.16E-11	1.27E-09	1.16E-11	1.27E-09	8.76E-10	1.41E-09	8.20E-10	1.41E-09	-	-	-	-	-	-	-	-	1.72E-09	2.82E-09
1,1,1-Trichloroethane	-	6.40E-05	2.36E-04	8.62E-05	9.47E-03	8.62E-05	9.47E-03	-	-	-	-	3.79E-05	3.96E-03	2.82E-05	3.96E-03	-	-	-	-	2.38E-04	1.89E-02
2,4-Dinitrotoluene	2.80E-07	9.40E-07	-	1.27E-06	1.39E-04	1.27E-06	1.39E-04	1.71E-05	2.76E-05	1.61E-05	2.76E-05	-	-	-	-	-	-	-	-	3.57E-05	2.78E-04
2-Chloroacetophenone	7.00E-06	-	-	-	-	-	-	4.29E-04	6.90E-04	4.01E-04	6.90E-04	-	-	-	-	-	-	-	-	8.30E-04	1.38E-03
5-Methyl chrysene	2.20E-08	-	-	-	-	-	-	1.35E-06	2.17E-06	1.26E-06	2.17E-06	-	-	-	-	-	-	-	-	2.61E-06	4.34E-06
Acenaphthene	5.10E-07	9.10E-07	2.11E-05	1.23E-06	1.35E-04	1.23E-06	1.35E-04	3.12E-05	5.03E-05	2.92E-05	5.03E-05	3.39E-06	3.54E-04	2.52E-06	3.54E-04	1.60E-10	-	1.83E-10	-	6.88E-05	7.09E-04
Acenaphthylene	2.50E-07	5.00E-06	2.53E-07	6.73E-06	7.39E-04	6.73E-06	7.39E-04	1.53E-05	2.46E-05	1.43E-05	2.46E-05	4.07E-08	4.25E-06	3.02E-08	4.25E-06	1.60E-10	-	1.83E-10	-	4.32E-05	1.48E-03
Acetaldehyde	5.70E-04	1.90E-04	-	2.56E-04	2.81E-02	2.56E-04	2.81E-02	3.49E-02	5.62E-02	3.27E-02	5.62E-02	-	-	-	-	-	-	-	-	6.81E-02	1.12E-01
Acetophenone	1.50E-05	2.60E-07	-	3.50E-07	3.85E-05	3.50E-07	3.85E-05	9.18E-04	1.48E-03	8.60E-04	1.48E-03	-	-	-	-	-	-	-	-	1.78E-03	2.96E-03
Acrolein	2.90E-04	7.80E-05	-	1.05E-04	1.15E-02	1.05E-04	1.15E-02	1.78E-02	2.86E-02	1.66E-02	2.86E-02	-	-	-	-	-	-	-	-	3.46E-02	5.72E-02
Anthracene	2.10E-07	3.00E-06	1.22E-06	4.04E-06	4.44E-04	4.04E-06	4.44E-04	1.29E-05	2.07E-05	1.20E-05	2.07E-05	1.96E-07	2.05E-05	1.46E-07	2.05E-05	2.14E-10	-	2.44E-10	-	3.33E-05	8.87E-04
Antimony	2.16E-05	4.20E-07	5.25E-03	5.65E-07	6.21E-05	5.65E-07	6.21E-05	1.32E-03	2.13E-03	1.24E-03	2.13E-03	8.44E-04	8.81E-02	6.27E-04	8.81E-02	-	-	-	-	4.03E-03	1.76E-01
Arsenic	2.29E-04	1.00E-06	1.32E-03	1.35E-06	1.48E-04	1.35E-06	1.48E-04	1.40E-02	2.25E-02	1.31E-02	2.25E-02	2.12E-04	2.22E-02	1.58E-04	2.22E-02	-	-	-	-	2.75E-02	4.51E-02
Benzene	1.30E-03	3.30E-03	2.14E-04	4.44E-03	4.88E-01	4.44E-03	4.88E-01	7.96E-02	1.28E-01	7.45E-02	1.28E-01	3.44E-05	3.59E-03	2.56E-05	3.59E-03	1.87E-07	-	2.13E-07	-	1.63E-01	9.76E-01
Benz(a)anthracene	8.00E-08	6.50E-08	4.01E-06	8.75E-08	9.61E-06	8.75E-08	9.61E-06	4.90E-06	7.89E-06	4.59E-06	7.89E-06	6.44E-07	6.73E-05	4.79E-07	6.73E-05	1.60E-10	-	1.83E-10	-	1.08E-05	1.35E-04
Benzo(a)pyrene	3.80E-08	2.60E-06	-	3.50E-06	3.85E-04	3.50E-06	3.85E-04	2.33E-06	3.75E-06	2.18E-06	3.75E-06	-	-	-	-	1.07E-10	-	1.22E-10	-	1.15E-05	7.69E-04
Benzo(b)fluoranthene	-	1.00E-07	-	1.35E-07	1.48E-05	1.35E-07	1.48E-05	-	-	-	-	-	-	-	-	1.60E-10	-	1.83E-10	-	2.70E-07	2.96E-05
Benzo(b,j,k)fluoranthene	1.10E-07	-	-	-	-	-	-	6.74E-06	1.08E-05	6.31E-06	1.08E-05	-	-	-	-	-	-	-	-	1.30E-05	2.17E-05
Benzo(b,k)fluoranthene	-	-	1.48E-06	-	-	-	-	-	-	-	-	2.38E-07	2.48E-05	1.77E-07	2.48E-05	-	-	-	-	4.15E-07	4.97E-05
Benzo(e)pyrene	-	2.60E-09	-	3.50E-09	3.85E-07	3.50E-09	3.85E-07	-	-	-	-	-	-	-	-	-	-	-	-	7.00E-09	7.69E-07
Benzo(g,h,i)perylene	2.70E-08	9.30E-08	2.26E-06	1.25E-07	1.38E-05	1.25E-07	1.38E-05	1.65E-06	2.66E-06	1.55E-06	2.66E-06	3.63E-07	3.79E-05	2.70E-07	3.79E-05	1.07E-10	-	1.22E-10	-	4.09E-06	7.59E-05
Benzo(k)fluoranthene	-	3.60E-08	-	4.85E-08	5.32E-06	4.85E-08	5.32E-06	-	-	-	-	-	-	-	-	1.60E-10	-	1.83E-10	-	9.73E-08	1.06E-05
Benzyl chloride	7.00E-04	-	-	-	-	-	-	4.29E-02	6.90E-02	4.01E-02	6.90E-02	-	-	-	-	-	-	-	-	8.30E-02	1.38E-01
Beryllium	2.72E-05	1.90E-06	2.78E-05	2.56E-06	2.81E-04	2.56E-06	2.81E-04	1.66E-03	2.68E-03	1.56E-03	2.68E-03	4.47E-06	4.67E-04	3.32E-06	4.67E-04	-	-	-	-	3.23E-03	5.36E-03
Biphenyl	1.70E-06	-	-	-	-	-	-	1.04E-04	1.68E-04	9.75E-05	1.68E-04	-	-	-	-	-	-	-	-	2.02E-04	3.35E-04
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	4.70E-08	-	6.33E-08	6.95E-06	6.33E-08	6.95E-06	4.47E-03	7.20E-03	4.19E-03	7.20E-03	-	-	-	-	-	-	-	-	8.66E-03	1.44E-02
Bromoform	3.90E-05	-	-	-	-	-	-	2.39E-03	3.85E-03	2.24E-03	3.85E-03	-	-	-	-	-	-	-	-	4.62E-03	7.69E-03
Cadmium	1.13E-05	1.90E-06	3.98E-04	2.56E-06	2.81E-04	2.56E-06	2.81E-04	6.93E-04	1.12E-03	6.49E-04	1.12E-03	6.40E-05	6.68E-03	4.76E-05	6.68E-03	-	-	-	-	1.46E-03	1.34E-02
Carbon disulfide	1.30E-04	1.30E-03	-	1.75E-03	1.92E-01	1.75E-03	1.92E-01	7.96E-03	1.28E-02	7.45E-03	1.28E-02	-	-	-	-	-	-	-	-	1.89E-02	3.85E-01
Carbon tetrachloride	-	8.90E-07	-	1.20E-06	1.32E-04	1.20E-06	1.32E-04	-	-	-	-	-	-	-	-	-	-	-	-	2.40E-06	2.63E-04
Chlorine	-	7.90E-04	-	1.06E-03	1.17E-01	1.06E-03	1.17E-01	-	-	-	-	-	-	-	-	-	-	-	-	2.13E-03	2.34E-01
Chlorobenzene	2.20E-05	1.70E-05	-	2.29E-05	2.51E-03	2.29E-05	2.51E-03	1.35E-03	2.17E-03	1.26E-03	2.17E-03	-	-	-	-	-	-	-	-	2.65E-03	5.03E-03
Chloroform	5.90E-05	3.10E-05	-	4.17E-05	4.58E-03	4.17E-05	4.58E-03	3.61E-03	5.82E-03	3.38E-03	5.82E-03	-	-	-	-	-	-	-	-	7.08E-03	1.16E-02
2-chloronaphthalene	-	2.40E-09	-	3.23E-09	3.55E-07	3.23E-09	3.55E-07	-	-	-	-	-	-	-	-	-	-	-	-	6.46E-09	7.10E-07
Chromium	2.60E-04	6.00E-07	8.45E-04	8.08E-07	8.87E-05	8.08E-07	8.87E-05	1.59E-02	2.56E-02	1.49E-02	2.56E-02	1.36E-04	1.42E-02	1.01E-04	1.42E-02	-	-	-	-	3.11E-02	5.13E-02
Chromium(VI)	7.90E-05	4.90E-07	2.48E-04	6.60E-07	7.25E-05	6.60E-07	7.25E-05	4.84E-03	7.79E-03	4.53E-03	7.79E-03	3.99E-05	4.16E-03	2.96E-05	4.16E-03	-	-	-	-	9.44E-03	1.56E-02
Chrysene	1.00E-07	3.80E-08	2.38E-06	5.12E-08	5.62E-06	5.12E-08	5.62E-06	6.12E-06	9.86E-06	5.73E-06	9.86E-06	3.82E-07	4.00E-05	2.84E-07	4.00E-05	1.60E-10	-	1.83E-10	-	1.26E-05	7.99E-05
Cobalt	1.40E-04	1.90E-07	6.02E-03	2.56E-07	2.81E-05	2.56E-07	2.81E-05	8.57E-03	1.38E-02	8.02E-03	1.38E-02	9.67E-04	1.01E-01	7.19E-04	1.01E-01	-	-	-	-	1.83E-02	2.02E-01
Cumene	5.30E-06	-	-	-	-	-	-	3.25E-04	5.23E-04	3.04E-04	5.23E-04	-	-	-	-	-	-	-	-	6.28E-04	1.05E-03
Cyanide	2.50E-03	-	-	-	-	-	-	1.53E-01	2.46E-01	1.43E-01	2.46E-01	-	-	-	-	-	-	-	-	2.96E-01	4.93E-01
Decachlorobiphenyl	-	2.70E-10	-	3.63E-10	3.99E-08	3.63E-10	3.99E-08	-	-	-	-	-	-	-	-	-	-	-	-	7.27E-10	7.99E-08
Dibenzo(a,h)anthracene	-	9.10E-09	1.67E-06	1.23E-08	1.35E-06	1.23E-08	1.35E-06	-	-	-	-	2.68E-07	2.80E-05	2.00E-07	2.80E-05	1.07E-10	-	1.22E-10	-	4.93E-07	5.61E-05
Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.07E-07	-	1.22E-07	-	2.29E-07	-
Dichlorbiphenyl	-	9.00E-10	-	1.21E-09	1.33E-07	1.21E-09	1.33E-07	-	-	-	-	-	-	-	-	-	-	-	-	2.42E-09	2.66E-07
1,2-Dichloroethane	-	2.90E-05	-	3.90E-05	4.29E-03	3.90E-05	4.29E-03	-	-	-	-	-	-	-	-	-	-	-	-	7.81E-05	8.58E-03
Dimethyl sulfate	4.80E-05	-	-	-	-	-	-	2.94E-03	4.73E-03	2.75E-03	4.73E-03	-	-	-	-	-	-	-	-	5.69E-03	9.47E-03
Di-n-butyl phthalate	-	3.30E-05	-	4.44E-05	4.88E-03	4.44E-05	4.88E-03	-	-	-	-	-	-	-	-	-	-	-	-	8.89E-05	9.76E-03
1,2,Dichloropropane	-	3.30E-05	-	4.44E-05	4.88E-03	4.44E-05	4.88E-03	-	-	-	-	-	-	-	-	-	-	-	-	8.89E-05	9.76E-03
4,6-Dintro-2-methylphenol	-	2.10E-06	-	2.83E-06	3.11E-04	2.83E-06	3.11E-04	-	-	-	-	-	-	-	-	-	-	-	-	5.65E-06	6.21E-04
2,4-Dinitrophenol	-	4.80E-07	-	6.46E-07	7.10E-05	6.46E-07	7.10E-05	-	-	-	-	-	-	-	-	-	-	-	-	1.29E-06	1.42E-04
Ethylbenzene	9.40E-05	1.50E-03	6.36E-05	2.02E-03	2.22E-01	2.02E-03	2.22E-01	5.76E-03	9.27E-03	5.39E-03	9.27E-03	1.02E-05	1.07E-03	7.60E-06	1.07E-03	-	-	-	-	1.52E-02	4.44E-01
Ethyl chloride	4.20E-05	-	-	-	-	-	-	2.57E-03	4.14E-03	2.41E-03	4.14E-03	-	-	-	-	-	-	-	-	4.98E-03	8.28E-03
Ethylene dibromide	1.20E-06	-	-	-	-	-	-	7.35E-05	1.18E-04	6.88E-05	1.18E-04	-	-	-	-	-	-	-	-	1.42E-04	2.37E-04
Ethylene dichloride	4.00E-05	-	-	-	-	-	-	2.45E-03	3.94E-03	2.29E-03	3.94E-03	-	-	-	-	-	-	-	-	4.74E-03	7.89E-03
Fluoranthene	7.10E-07	1.60E-06	4.84E-06	2.15E-06	2.37E-04	2.15E-06	2.37E-04	4.35E-05	7.00E-05	4.07E-05	7.00E-05	7.78E-07	8.13E-05	5.78E-07	8.13E-05	2.67E-10	-	3.05E-10	-	8.98E-05	4.73E-04
Fluorene	9.10E-07	3.40E-06	4.47E-06	4.58E-06	5.03E-04	4.58E-06	5.03E-04	5.57E-05	8.97E-05	5.22E-05	8.97E-05	7.18E-07	7.51E-05	5.34E-07	7.51E-05	2.49E-10	-	2.84E-10	-	1.18E-04	1.01E-03
Formaldehyde	2.40E-04	1.30E-03	3.30E-02	1.75E-03	1.92E-01	1.75E-03	1.92E-01	1.47E-02	2.37E-02	1.38E-02	2.37E-02	5.30E-03	5.54E-01	3.94E-03	5.54E-01	6.68E-06	-	7.61E-06	-	4.12E-02	1.11E+00
Heptachlorobiphenyl	-	6.60E-11	-	8.89E-11	9.76E-09	8.89E-11	9.76E-09	-	-	-	-	-	-	-	-	-	-	-	-	1.78E-10	1.95E-08
Hexachlorobenzene	-	1.00E-06	-	1.35E-06	1.48E-04	1.35E-06	1.48E-04	-	-	-	-	-	-	-	-	-	-	-	-	2.69E-06	2.96E-04
Hexachlorobiphenly	-	8.00E-10	-	1.08E-09	1.18E-07	1.08E-09	1.18E-07	-	-	-	-	-	-	-	-	-	-	-	-	2.15E-09	2.37E-07
Hexane	6.70E-05	2.90E-04	-	3.90E-04	4.29E-02	3.90E-04	4.29E-02	4.10E-03	6.61E-03	3.84E-03	6.61E-03	-	-	-	-	1.60E-04	-	1.83E-04	-	9.07E-03	8.58E-02
Hydrogen Chloride	7.41E-01	4.19E-04	-	5.64E-04	6.20E-02	5.64E-04	6.20E-02	3.12E+00	5.03E+00	2.92E+00	5.03E+00	-	-	-	-	-	-	-	-	6.05E+00	1.01E+01
Hydrogen fluoride	5.48E-02	-	-	-	-	-	-	3.35E+00	5.40E+00	3.14E+00	5.40E+00	-	-	-	-	-	-	-	-	6.49E+00	1.08E+01

TABLE 4
SUMMARY OF HAZARDOUS AIR POLLUTANT EMISSIONS

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	SR4, SR6 Coal Emission Factor (lb/ton)	SR4, SR6 Biomass Emission Factor (lb/MMBTU)	SR4 and SR6 Oil Emission Factor (lb/1000 gal)	SR4 (biomass)		SR6 (biomass)		SR4 (coal)		SR6 (coal)		SR4 (oil)		SR6 (oil)		SR4 (Gas)		SR6 (Gas)		Totals	
				Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)	Actual Emissions (tons/yr)	Potential Emissions (tons/yr)
Indeno(1,2,3-cd)pyrene	6.10E-08	8.70E-08	-	1.17E-07	1.29E-05	1.17E-07	1.29E-05	3.74E-06	6.01E-06	3.50E-06	6.01E-06	-	-	-	-	1.60E-10	-	1.83E-10	-	7.47E-06	2.57E-05
Indo(1,2,3-cd)pyrene	-	-	2.14E-06	-	-	-	-	-	-	-	-	3.44E-07	3.59E-05	2.56E-07	3.59E-05	-	-	-	-	6.00E-07	7.19E-05
Isophorone	5.80E-04	-	-	-	-	-	-	3.55E-02	5.72E-02	3.33E-02	5.72E-02	-	-	-	-	-	-	-	-	6.88E-02	1.14E-01
Lead	1.75E-04	5.80E-06	1.51E-03	7.81E-06	8.58E-04	7.81E-06	8.58E-04	1.07E-02	1.72E-02	1.00E-02	1.72E-02	2.43E-04	2.54E-02	1.80E-04	2.54E-02	-	-	-	-	2.11E-02	5.07E-02
Manganese	5.11E-04	1.50E-04	3.00E-03	2.02E-04	2.22E-02	2.02E-04	2.22E-02	3.13E-02	5.04E-02	2.93E-02	5.04E-02	4.82E-04	5.04E-02	3.58E-04	5.04E-02	-	-	-	-	6.18E-02	1.01E-01
Mercury	3.06E-02	6.60E-07	1.13E-04	8.89E-07	9.76E-05	8.89E-07	9.76E-05	1.87E+00	3.02E+00	1.75E+00	3.02E+00	1.82E-05	1.90E-03	1.35E-05	1.90E-03	-	-	-	-	3.63E+00	6.03E+00
Methyl bromide	1.60E-04	1.50E-05	-	2.02E-05	2.22E-03	2.02E-05	2.22E-03	9.80E-03	1.58E-02	9.17E-03	1.58E-02	-	-	-	-	-	-	-	-	1.90E-02	3.16E-02
3-MethylChloranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.60E-10	-	1.83E-10	-	3.43E-10	-
Methyl chloride	5.30E-04	4.00E-05	-	5.39E-05	5.92E-03	5.39E-05	5.92E-03	3.25E-02	5.23E-02	3.04E-02	5.23E-02	-	-	-	-	-	-	-	-	6.29E-02	1.05E-01
Methyl hydrazine	1.70E-04	-	-	-	-	-	-	1.04E-02	1.68E-02	9.75E-03	1.68E-02	-	-	-	-	-	-	-	-	2.02E-02	3.35E-02
Methyl methacrylate	2.00E-05	-	-	-	-	-	-	1.22E-03	1.97E-03	1.15E-03	1.97E-03	-	-	-	-	-	-	-	-	2.37E-03	3.94E-03
Methyl tert butyl ether	3.50E-05	-	-	-	-	-	-	2.14E-03	3.45E-03	2.01E-03	3.45E-03	-	-	-	-	-	-	-	-	4.15E-03	6.90E-03
Methylene chloride	2.90E-04	5.40E-04	-	7.27E-04	7.99E-02	7.27E-04	7.99E-02	1.78E-02	2.86E-02	1.66E-02	2.86E-02	-	-	-	-	-	-	-	-	3.58E-02	1.60E-01
Methylisobutylketone	-	2.30E-05	-	3.10E-05	3.40E-03	3.10E-05	3.40E-03	-	-	-	-	-	-	-	-	-	-	-	-	6.19E-05	6.80E-03
2-Methylnaphthalene	-	1.60E-07	-	2.15E-07	2.37E-05	2.15E-07	2.37E-05	-	-	-	-	-	-	-	-	2.14E-09	-	2.44E-09	-	4.35E-07	4.73E-05
Monochlorobiphenyl	-	2.20E-10	-	2.96E-10	3.25E-08	2.96E-10	3.25E-08	-	-	-	-	-	-	-	-	-	-	-	-	5.92E-10	6.51E-08
Naphthalene	1.30E-05	1.64E-04	1.13E-03	2.21E-04	2.43E-02	2.21E-04	2.43E-02	7.96E-04	1.28E-03	7.45E-04	1.28E-03	1.82E-04	1.90E-02	1.35E-04	1.90E-02	5.43E-08	-	6.19E-08	-	2.30E-03	4.85E-02
Nickel	3.45E-04	2.90E-06	8.45E-02	3.90E-06	4.29E-04	3.90E-06	4.29E-04	2.11E-02	3.40E-02	1.98E-02	3.40E-02	1.36E-02	1.42E+00	1.01E-02	1.42E+00	-	-	-	-	6.46E-02	2.84E+00
4-nitrophenol	-	3.30E-07	-	4.44E-07	4.88E-05	4.44E-07	4.88E-05	-	-	-	-	-	-	-	-	-	-	-	-	8.89E-07	9.76E-05
OCDD	-	-	3.10E-09	-	-	-	-	-	-	-	-	4.98E-10	5.20E-08	3.70E-10	5.20E-08	-	-	-	-	8.69E-10	1.04E-07
Pentachlorobiphenyl	-	1.80E-09	-	2.42E-09	2.66E-07	2.42E-09	2.66E-07	-	-	-	-	-	-	-	-	-	-	-	-	4.85E-09	5.32E-07
Pentachlorophenol	-	4.60E-08	-	6.19E-08	6.80E-06	6.19E-08	6.80E-06	-	-	-	-	-	-	-	-	-	-	-	-	1.24E-07	1.36E-05
Perylene	-	5.20E-10	-	7.00E-10	7.69E-08	7.00E-10	7.69E-08	-	-	-	-	-	-	-	-	-	-	-	-	1.40E-09	1.54E-07
Phenanthrene	2.70E-06	7.00E-06	1.05E-05	9.42E-06	1.04E-03	9.42E-06	1.04E-03	1.65E-04	2.66E-04	1.55E-04	2.66E-04	1.69E-06	1.76E-04	1.25E-06	1.76E-04	1.51E-09	-	1.73E-09	-	3.42E-04	2.07E-03
Phenol	1.60E-05	1.40E-05	-	1.88E-05	2.07E-03	1.88E-05	2.07E-03	9.80E-04	1.58E-03	9.17E-04	1.58E-03	-	-	-	-	-	-	-	-	1.93E-03	4.14E-03
Propionaldehyde	3.80E-04	6.10E-05	-	8.21E-05	9.02E-03	8.21E-05	9.02E-03	2.33E-02	3.75E-02	2.18E-02	3.75E-02	-	-	-	-	-	-	-	-	4.52E-02	7.49E-02
Propyelene Oxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	3.30E-07	3.70E-06	4.25E-06	4.98E-06	5.47E-04	4.98E-06	5.47E-04	2.02E-05	3.25E-05	1.89E-05	3.25E-05	6.83E-07	7.14E-05	5.08E-07	7.14E-05	4.45E-10	-	5.08E-10	-	5.03E-05	1.09E-03
Selenium	6.90E-05	3.00E-06	6.83E-04	4.04E-06	4.44E-04	4.04E-06	4.44E-04	4.22E-03	6.80E-03	3.96E-03	6.80E-03	1.10E-04	1.15E-02	8.16E-05	1.15E-02	-	-	-	-	8.38E-03	2.29E-02
Styrene	2.50E-05	6.40E-04	-	8.62E-04	9.47E-02	8.62E-04	9.47E-02	1.53E-03	2.46E-03	1.43E-03	2.46E-03	-	-	-	-	-	-	-	-	4.69E-03	1.89E-01
tetrachlorodibenzo-p-dioxins	-	4.70E-10	-	6.33E-10	6.95E-08	6.33E-10	6.95E-08	-	-	-	-	-	-	-	-	-	-	-	-	1.27E-09	1.39E-07
2,3,7,8-tetrachlorodibenzofuran	-	9.00E-11	-	1.21E-10	1.33E-08	1.21E-10	1.33E-08	-	-	-	-	-	-	-	-	-	-	-	-	2.42E-10	2.66E-08
Tetrachlordibenzofurans	-	7.50E-10	-	1.01E-09	1.11E-07	1.01E-09	1.11E-07	-	-	-	-	-	-	-	-	-	-	-	-	2.02E-09	2.22E-07
Tetrachlorobiphenyl	-	3.40E-09	-	4.58E-09	5.03E-07	4.58E-09	5.03E-07	-	-	-	-	-	-	-	-	-	-	-	-	9.15E-09	1.01E-06
Tetrachloroethylene	4.30E-05	5.20E-05	-	7.00E-05	7.69E-03	7.00E-05	7.69E-03	2.63E-03	4.24E-03	2.47E-03	4.24E-03	-	-	-	-	-	-	-	-	5.24E-03	1.54E-02
Toluene	2.40E-04	2.90E-05	6.20E-03	3.90E-05	4.29E-03	3.90E-05	4.29E-03	1.47E-02	2.37E-02	1.38E-02	2.37E-02	9.96E-04	1.04E-01	7.41E-04	1.04E-01	3.03E-07	-	3.45E-07	-	3.03E-02	2.08E-01
Trichloroethylene	-	2.80E-05	-	3.77E-05	4.14E-03	3.77E-05	4.14E-03	-	-	-	-	-	-	-	-	-	-	-	-	7.54E-05	8.28E-03
Trichlorobiphenyl	-	5.50E-09	-	7.40E-09	8.13E-07	7.40E-09	8.13E-07	-	-	-	-	-	-	-	-	-	-	-	-	1.48E-08	1.63E-06
2,4,6-Trichlorophenol	-	2.20E-07	-	2.96E-07	3.25E-05	2.96E-07	3.25E-05	-	-	-	-	-	-	-	-	-	-	-	-	5.92E-07	6.51E-05
Vinyl chloride	-	1.80E-05	-	2.42E-05	2.66E-03	2.42E-05	2.66E-03	-	-	-	-	-	-	-	-	-	-	-	-	4.85E-05	5.32E-03
Vinyl acetate	7.60E-06	-	-	-	-	-	-	4.65E-04	7.49E-04	4.36E-04	7.49E-04	-	-	-	-	-	-	-	-	9.01E-04	1.50E-03
Xylenes	3.70E-05	2.80E-05	1.09E-04	3.77E-05	4.14E-03	3.77E-05	4.14E-03	2.27E-03	3.65E-03	2.12E-03	3.65E-03	1.75E-05	1.83E-03	1.30E-05	1.83E-03	-	-	-	-	4.49E-03	8.28E-03
Total All HAP				1.51E-02	1.66E+00	1.51E-02	1.66E+00	9.00E+00	1.45E+01	8.43E+00	1.45E+01	2.33E-02	2.43E+00	1.73E-02	2.43E+00	1.68E-04	-	1.91E-04	-	17.50	28.99
Total of Highest HAP				4.44E-03	4.88E-01	4.44E-03	4.88E-01	3.35E+00	5.40E+00	3.14E+00	5.40E+00	1.36E-02	1.42E+00	1.01E-02	1.42E+00	1.60E-04	-	1.83E-04	-	6.49	10.80

TABLE 5
MAJOR MODIFICATION APPLICABILITY EVALUATION FOR NSR AND PSD

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	Program	Post - Project Emissions (tons/yr)	SR4 and SR6 2009/2010 Actual Emissions (tons/yr)	Contemporaneous Decreases (tons/yr)[1]	Net Emissions Increase (tons/yr)	Significant Emissions / Major Source Threshold (tons/yr)	Proposed Installation Significant? (Yes/No)
NO_x	NSR	833.6	833.6	0.0	0.0	25	No
NO_2	PSD	833.6	833.6	0.0	0.0	25	No
CO	PSD	60.7	60.7	0.0	0.0	100	No
PM	PSD	62.2	62.2	0.0	0.0	25	No
$PM_{2.5}$	PSD	18.2	18.2	0.0	0.0	10	No
SO_2	PSD	3401.3	3401.3	0.0	0.0	40	No
VOC	NSR	7.0	7.0	0.0	0.0	25	No
Lead	PSD	0.021	0.021	0.0	0.0	0.6	No
Sulfuric Acid Mist	PSD	5.4	5.4	0.0	0.0	7	No
H_2S/TRS	PSD	0.0	0.0	0.0	0.0	10	No
CO_2	N/A	607,171	607,171	0.0	0.0	75,000	No

Note:
1. USEPA AP-42 emission factors were used when CEM data was not available.
2. Installation and operation of DSI is anticipated to result in post-project net reductions in SO_2 and sulfuric acid mist emissions from SR4 and SR6. No data is available to quantify these reductions at this time.

APPENDIX A

APPLICATION FORMS

STATE OF NEW HAMPSHIRE
Department of Environmental Services
Air Resources Division
P.O. Box 95
Concord, NH 03302-0095
Telephone: 603-271-1370

Form ARD-1

RECEIVED
NEW HAMPSHIRE
FEB 27 2014
AIR RESOURCES DIVISION

General Information for All Permit Applications

I. FACILITY INFORMATION - *Complete the following*:

A. Type of Application: ☐ New ☐ Renewal ☒ Modification

B. Physical Location:

Schiller Station
Facility Name

400 Gosling Rd
Street

Portsmouth NH 03801
Town/City State Zip Code

C. Mailing Address:

780 North Commercial Street
Street/P.O. Box

Manchester NH 03101
Town/City State Zip Code

603-431-2550
Telephone Number

D. USGS Coordinates:

	UTM	or	Latitude/Longitude		
Easting:	354770	Deg		Min	Sec
Northing:	4772950	Deg		Min	Sec

E. Owner:

Public Service Company of New Hampshire
Company

780 North Commercial Street
Street/P.O. Box

Manchester NH 03101
Town/City: State Zip Code

603-624-5008
Telephone Number

F. Parent Corporation:

Northeast Utilities
Company

Contact Person/Title

56 Prospect Street
Street/P.O. Box

Hartford CT 06130
Town/City: State Zip Code

Telephone Number

G. Contact Information

1. General/Technical Contact:

Sheila A. Burke
Contact Person

Senior Compliance Consultant
Title

780 North Commercial Street
Address

Manchester NH 03101
Town/City State Zip Code

603-634-2512
Telephone Number

sheila.burke@nu.com
E-mail Address

2. Application Preparation:

GZA GeoEnvironmental, Inc.
Company

Kenneth D. Boivin
Contact Person

380 Harvey Road
Address

Manchester NH 03103
Town/City State Zip Code

603-232-8719
Telephone Number

kenneth.boivin@gza.com
E-mail Address

Form ARD-1

3. Legal Contact:

Linda Landis
Contact Person

Senior Counsel
Title

780 North Commercial Street
Address

Manchester NH 03101
Town/City State Zip Code

603-634-2700
Telephone Number

linda.landis@nu.com
E-mail Address

4. Invoicing Contact:

Sheila A. Burke
Contact Person

Senior Compliance Consultant
Title

780 North Commercial Street
Address

Manchester NH 03101
Town/City State Zip Code

603-634-2512
Telephone Number

sheila.burke@nu.com
E-mail Address

H. Major Activity or Product Descriptions - *List all activities performed at this facility*:

Description of Source or Process	SIC Code
Electric power generation	4911

I. Other Sources or Devices - *List sources or devices at the facility (other than those that are the subject of this application) that are permitted pursuant to Env-A 600:*

Source or Device	Permit #	Expiration Date
SR5 and secondary coal crusher	TP-0085	03/31/2013
SRCT	TP-0106	04/30/2014
SREG, along with all other devices	TV-OP-053	Currently Draft

II. Total Facility Emissions Data:

Pollutant	CAS #	Actual (lb/hr)	Potential (lb/hr)	Actual (ton/yr)	Potential (ton/yr)
SO_2	7446-09-5	928.9	2,848.8	3,256.1	12,448.5
NO_x	NA	393.2	891.3	995.2	3,697.0
CO	630-08-8	19.8	127.2	65.4	599.3
PM	NA	33.2	71.6	58.1	309.9
$PM_{2.5}$	NA	5.2	28.1	17.7	209.9
VOC	NA	8.5	9.6	19.5	44.1

Note: For Regulated Toxic Air Pollutants list name and Chemical Abstract Service Number (CAS #) – *use additional sheets if necessary.*

Notes: See Tables 1 through 5 for additional facility emissions data.

Actual emissions are based on Calendar Year 2010 operations.

Form ARD-1

III. Support Data *The following data must be submitted with this application:*

☒ A copy of all calculations used in determining emissions;
☒ A copy of a USGS map section with the site location clearly indicated; and **(Previously Submitted)**
☒ A to-scale site plan of the facility showing: **(Previously Submitted)**
1. the locations of all emission points;
2. the dimensions of all buildings, including roof heights; and
3. the facility's property boundary.

IV. Certification (To be completed by a responsible official only):

I certify that I have the right, title, or interest in all of the property that is proposed for development or use because I own, lease, or have binding options to purchase all of the property proposed for development or use.

I am authorized to make this submission on behalf of the affected source or affected units for which this submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the information submitted in this document and all of its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Print/Type Name: William H. Smagula, P.E. Title: PSNH Vice President - Generation

Signed: William H. Smagula Date: February 27, 2014

E-mail Address: william.smagula@nu.com

STATE OF NEW HAMPSHIRE
Department of Environmental Services
Air Resources Division

Form ARD-2

Information Required for Permits for Fuel Burning Devices

RECEIVED
NEW HAMPSHIRE
FEB 27 2014
AIR RESOURCES DIVISION

I. EQUIPMENT INFORMATION – *Complete a separate form for each device.*

Device Description: Steam Boiler SR4

Date Construction Commenced: 1952 **Device Start-Up Date:** 1952

A. Boiler ☐ Not Applicable

Foster Wheeler
Boiler Manufacturer

FW
Boiler Model Number

90-1628
Boiler Serial Number

574 (coal) / 575 (oil)
Gross Heat Input Nameplate Rating (MMBtu/hr)

NA
Burner Manufacturer

CE RO Coal, PEC Oil
Burner Model Number

NA
Burner Serial Number

Coal: 22.51 ton/hr (@12,750 BTU/lb)
Oil: 3833.3 gal/hr (@0.15 MMBTU/gal)
Biomass: 2.25 ton/hour (@7,500 BTU/lb)
Potential Fuel Flow Rate
☐ gal/hr ☐ mmcf/hr ☐ ton/hr

1. Type of Burner:

a. Solid Fuel:
- ☐ Cyclone
- ☒ Pulverized (☐ wet ☒ dry)
- ☐ Spreader Stoker
- ☐ Underfeed Stoker
- ☐ Overfeed Stoker
- ☐ Hand-Fired
- ☐ Fly Ash Re-injection
- ☐ Other (specify): _____

b. Liquid Fuel:
- ☒ Pressure Gun
- ☐ Rotary Cup
- ☐ Steam Atomization
- ☐ Air Atomization
- ☐ Other (specify): _____

c. Gaseous Fuel:
- ☒ Natural Gas (Ignition)
- ☐ Propane
- ☐ Other (specify): _____

2. Combustion Type:

- ☐ Tangential Firing
- ☐ Opposite End Firing
- ☐ Limited Excess Firing
- ☐ Flue Gas Recirculation
- ☐ Staged Combustion
- ☐ Biased Firing
- ☒ One End Only Firing
- ☐ Other (specify): _____

B. Internal Combustion Engines/Combustion Turbines ☒ Not Applicable

Manufacturer

Model Number

Serial Number

Fuel Flow Rate
☐ gal/hr ☐ mmcf/hr

Engine Output Rating
☐ hp ☐ kW

Reason for Engine Use

Application Preparation Date: February 2014

Form ARD-2

C. Stack Information

Is unit equipped with multiple stacks? ☐ Yes ☒ No *(if yes, provide data for each stack)*

Identify other devices on this stack: None

Is Section 123 of the Clean Air Act applicable? ☐ Yes ☒ No

Is stack monitoring used? ☒ Yes ☐ No

If yes, Describe: SO2, NOx, CO2, flow, opacity, CO(not certified)

Is stack capped or otherwise restricted? ☐ Yes ☒ No

If yes, Describe:

Stack exit orientation: ☒ Vertical ☐ Horizontal ☐ Downward

8.0 ft
Stack ☒ Inside Diameter (ft) ☐ Exit Area (ft^2)

226
Discharge height above ground level (ft)

230,000 (nominal)
Exhaust Flow (acfm)

76.3 ft/sec
Exhaust Velocity (ft/sec)

412
Exhaust Temperature (°F)

II. OPERATIONAL INFORMATION

A. Fuel Usage Information

1. Fuel Supplier:

Various
Supplier's Name

Street

Town/City State Zip Code

Telephone Number

2. Fuel Additives:

Not Applicable
Manufacturer's Name

Street

Town/City State Zip Code

Telephone Number

Identification of Additive

Consumption Rate (gallons per 1000 gallons of fuel)

3. Fuel Information *(List each fuel utilized by this device)*:

Type	% Sulfur	% Ash	% Moisture (solid fuels only)	Heat Rating (specify units)	Potential Heat Input (MMBtu/hr)	Actual Annual Usage (specify units)
Coal	1.66	5 - 8	5 - 8	12,750 Btu/lb	574	197,187.6 tons
#6 Oil	2.00	0.07	NA	150,000 Btu/gal	575	33,579,971 gal
Biomass	0.01-0.04	0.72-2.69	2.69-41.68	7500 Btu/lb	33.77	179.5 tons

B. Hours of Operation

Hours per day: 24 Days per year: 365

Form ARD-2

III. POLLUTION CONTROL EQUIPMENT ☐ Not Applicable

A. Type of Equipment *Note: if process utilizes more than one control device, provide data for each device*

- ☐ baffled settling chamber
- ☐ long cone cyclone
- ☐ multiple cyclone (_____ inch diameter)
- ☒ electrostatic precipitator
- ☐ spray tower
- ☐ venturi scrubber
- ☐ afterburners (incineration)
- ☐ selective catalytic reduction
- ☐ reburn
- ☒ other (specify): Overfire Air, Dry Sorbent Injection, Activated Carbon Injection
- ☐ wide bodied cyclone
- ☐ irrigated long cone cyclone
- ☐ carbon absorption
- ☐ irrigated electrostatic precipitator
- ☐ absorption tower
- ☐ baghouse
- ☐ packed tower/column
- ☒ selective non-catalytic reduction

B. Pollutant Input Information

Pollutant	Temperature (°F)	Actual (lb/hr)	Potential (lb/hr)	Actual (ton/yr)	Potential (ton/yr)
SO_2	< 785°	456.5	1,380.0	1,646.2	6,044.4
NO_x	< 785°	Not Available	Not Available	Not Available	Not Available
CO	< 785°	8.2	65.1	30.3	88.7
PM	< 785°	Not Available	Not Available	Not Available	Not Available
$PM_{2.5}$	< 785°	Not Available	Not Available	Not Available	Not Available
VOC	< 785°	1.0	2.9	3.6	12.8

Note: Actual emissions are based on Calendar Year 2010 Emissions.

Method used to determine entering emissions:

☒ stack test ☐ vendor data ☒ emission factor ☒ material balance

☐ other (specify):_____

C. Operating Data

1. Capture Efficiency: 100% Verified by: ☐ test ☒ calculations
2. Control Efficiency: Varies% Verified by: ☒ test ☐ calculations
3. Normal Operating Conditions *(supply the following data as applicable)*

230,000 (nominal) Total gas volume through unit (acfm)	< 785 Temperature (°F)	Not Available Percent Carbon Dioxide (CO_2)
45 – 60 KVDC Voltage	Not Applicable Spark Rate	Not Applicable Milliamps
0.6 – 8 Pressure Drop (inches of water)	Not Applicable Liquid Recycle Rate (gallons per minute)	

Form ARD-2

IV. DEVICE EMISSIONS DATA:

Pollutant	Temperature (°F)	Actual (lb/hr)	Potential (lb/hr)	Actual (ton/yr)	Potential (ton/yr)
SO_2	< 785	456.5	1,377.6	1,646.2	6,033.9
NO_x	< 785	115.3	287.5	415.7	1,158.5
CO	< 785	8.2	11.3	29.5	88.7
PM	< 785	7.9	17.3	28.4	75.6
$PM_{2.5}$	< 785	2.3	7.1	8.2	31.0
VOC	< 785	1.0	2.9	3.6	12.8

Notes: Actual emissions are based on Calendar Year 2010 Emissions. Refer to Tables 1 through 5 for additional emissions data.

Method used to determine exiting emissions:

☒ stack test ☒ vendor data ☒ emission factor ☐ material balance

☒ other (specify): PERMIT LIMITS USED FOR POTENTIAL SO_2, NO_X, TSP. EMISSION FACTORS USED FOR CO, VOC. ACTUAL EMISSIONS ARE 2010 EMISSIONS REPORTED TONS, LB/HR BASED ON 2010 OPERATING HOURS.

STATE OF NEW HAMPSHIRE
Department of Environmental Services
Air Resources Division

Form ARD-2

Information Required for Permits for Fuel Burning Devices

RECEIVED
NEW HAMPSHIRE
FEB 27 2014
AIR RESOURCES DIVISION

I. EQUIPMENT INFORMATION – *Complete a separate form for each device.*

Device Description: Steam Boiler SR6

Date Construction Commenced: 1957 **Device Start-Up Date:** 1957

A. Boiler ☐ Not Applicable

Foster Wheeler
Boiler Manufacturer

FW
Boiler Model Number

36-3413
Boiler Serial Number

574 (coal) / 575 (oil)
Gross Heat Input Nameplate Rating (MMBtu/hr)

NA
Burner Manufacturer

CE RO Coal, PEC Oil
Burner Model Number

NA
Burner Serial Number

Coal: 22.51 ton/hr (@12,750 BTU/lb)
Oil: 3833.3 gal/hr (@0.15 MMBTU/gal)
Biomass: 2.25 ton/hour (@7,500 BTU/lb)
Potential Fuel Flow Rate

☐ gal/hr
☐ mmcf/hr
☐ ton/hr

1. Type of Burner:

a. Solid Fuel:

- ☐ Cyclone
- ☒ Pulverized (☐ wet ☒ dry)
- ☐ Spreader Stoker
- ☐ Underfeed Stoker
- ☐ Overfeed Stoker
- ☐ Hand-Fired
- ☐ Fly Ash Re-injection
- ☐ Other (specify): _____

b. Liquid Fuel:

- ☒ Pressure Gun
- ☐ Rotary Cup
- ☐ Steam Atomization
- ☐ Air Atomization
- ☐ Other (specify): _____

c. Gaseous Fuel:

- ☒ Natural Gas (Ignition)
- ☐ Propane
- ☐ Other (specify): _____

2. Combustion Type:

- ☐ Tangential Firing
- ☐ Opposite End Firing
- ☐ Limited Excess Firing
- ☐ Flue Gas Recirculation
- ☐ Staged Combustion
- ☐ Biased Firing
- ☒ One End Only Firing
- ☐ Other (specify): _____

B. Internal Combustion Engines/Combustion Turbines ☒ Not Applicable

Manufacturer

Model Number

Serial Number

Fuel Flow Rate

☐ gal/hr
☐ mmcf/hr

Engine Output Rating

☐ hp
☐ kW

Reason for Engine Use

Application Preparation Date: February 2014

Form ARD-2

C. Stack Information

Is unit equipped with multiple stacks? ☐ Yes ☒ No *(if yes, provide data for each stack)*

Identify other devices on this stack: None

Is Section 123 of the Clean Air Act applicable? ☐ Yes ☒ No

Is stack monitoring used? ☒ Yes ☐ No

If yes, Describe: SO_2, NO_x, CO2, flow, opacity, CO(not certified)

Is stack capped or otherwise restricted? ☐ Yes ☒ No

If yes, Describe:

Stack exit orientation: ☒ Vertical ☐ Horizontal ☐ Downward

8.0 ft
Stack ☒ Inside Diameter (ft) ☐ Exit Area (ft^2)

226
Discharge height above ground level (ft)

230,000 (nominal)
Exhaust Flow (acfm)

76.3 ft/sec
Exhaust Velocity (ft/sec)

412
Exhaust Temperature (°F)

II. OPERATIONAL INFORMATION

A. Fuel Usage Information

1. Fuel Supplier:

Various
Supplier's Name

Street

Town/City State Zip Code

Telephone Number

2. Fuel Additives:

Not Applicable
Manufacturer's Name

Street

Town/City State Zip Code

Telephone Number

Identification of Additive

Consumption Rate (gallons per 1000 gallons of fuel)

3. Fuel Information *(List each fuel utilized by this device)*:

Type	% Sulfur	% Ash	% Moisture (solid fuels only)	Heat Rating (specify units)	Potential Heat Input (MMBtu/hr)	Actual Annual Usage (specify units)
Coal	1.66	5 - 8	5 - 8	12,750	574	197,187.6 tons
#6 Oil	2.00	0.07	NA	150,000	575	33,579,971 gal
Biomass	0.01-0.04	0.72-2.69	2.69-41.68	7,500 Btu/lb	33.77	179.5 tons

B. Hours of Operation

Hours per day: 24 Days per year: 365

Form ARD-2

III. POLLUTION CONTROL EQUIPMENT ☐ Not Applicable

A. Type of Equipment *Note: if process utilizes more than one control device, provide data for each device*

- ☐ baffled settling chamber
- ☐ long cone cyclone
- ☐ multiple cyclone (_____ inch diameter)
- ☒ electrostatic precipitator
- ☐ spray tower
- ☐ venturi scrubber
- ☐ afterburners (incineration)
- ☐ selective catalytic reduction
- ☐ reburn
- ☒ other (specify): Overfire Air, Dry Sorbent Injection, Activated Carbon injection
- ☐ wide bodied cyclone
- ☐ irrigated long cone cyclone
- ☐ carbon absorption
- ☐ irrigated electrostatic precipitator
- ☐ absorption tower
- ☐ baghouse
- ☐ packed tower/column
- ☒ selective non-catalytic reduction

B. Pollutant Input Information

Pollutant	Temperature (°F)	Actual (lb/hr)	Potential (lb/hr)	Actual (ton/yr)	Potential (ton/yr)
SO_2	< 785°	466.7	1,377.6	1,608.1	6,033.9
NO_X	< 785°	Not Available	Not Available	Not Available	Not Available
CO	< 785°	7.9	11.3	27.3	88.7
PM	< 785°	Not Available	Not Available	Not Available	Not Available
$PM_{2.5}$	< 785°	Not Available	Not Available	Not Available	Not Available
VOC	< 785°	0.8	2.9	2.6	12.8

Note: Actual emissions are based on Calendar Year 2010 Emissions.

Method used to determine entering emissions:

☒ stack test ☐ vendor data ☒ emission factor ☒ material balance

☐ other (specify): _____

C. Operating Data

1. Capture Efficiency: 100% Verified by: ☐ test ☒ calculations
2. Control Efficiency: Varies Verified by: ☒ test ☐ calculations
3. Normal Operating Conditions *(supply the following data as applicable)*

230,000 (nominal) Total gas volume through unit (acfm)	< 785 Temperature (°F)	Not Available Percent Carbon Dioxide (CO_2)
45 – 60 KVDC Voltage	Not Applicable Spark Rate	Not Applicable Milliamps
0.6 – 8 Pressure Drop (inches of water)	Not Applicable Liquid Recycle Rate (gallons per minute)	

Form ARD-2

IV. DEVICE EMISSIONS DATA:

Pollutant	Temperature (°F)	Actual (lb/hr)	Potential (lb/hr)	Actual (ton/yr)	Potential (ton/yr)
SO_2	< 785	466.7	1,377.6	1,608.1	6,033.9
NO_X	< 785	118.9	287.5	409.7	1,158.8
CO	< 785	7.9	11.3	27.3	88.7
PM	< 785	7.8	17.3	26.7	75.6
$PM_{2.5}$	< 785	2.3	7.1	7.8	31.0
VOC	< 785	0.8	2.9	2.6	12.8

Note: Actual emissions are based on Calendar Year 2010 Emissions. Refer to Tables 1 through 5 for additional emissions data.

Method used to determine exiting emissions:

☒ stack test ☒ vendor data ☒ emission factor ☐ material balance

☒ other (specify): PERMIT LIMITS USED FOR POTENTIAL SO_2, NO_X, TSP. EMISSION FACTORS USED FOR CO, VOC. ACTUAL EMISSIONS ARE 2010 EMISSIONS REPORTED TONS, LB/HR BASED ON 2010 OPERATING HOURS.

APPENDIX B

HISTORICAL EMISSIONS DATA AND SUPPORTING CALCULATIONS AND DOCUMENTATION

TABLE B-1
2009 - 2013 EMISSIONS SUMMARY

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

SR4									
Year	Hours	Coal (tons)	Oil (gallons)	Annual Emissions (tons)					
				TSP	PM10	SO2	NOX	CO	VOC
2009	7265	129998	341838	32.99	3.31	1828.30	428.50	33.36	4.03
2010	7213	114928	300954	28.41	5.59	1646.20	415.70	29.49	3.56
2011	3940	64587	736176	16.54	3.05	877.90	233.50	18.01	2.22
2012	1785	25424	146440	6.41	1.38	369.60	87.90	6.75	0.82
2013	3041	48154	204721	11.78	2.36	803.90	165.30	12.58	1.52

SR6									
Year	Hours	Coal (tons)	Oil (gallons)	Annual Emissions (tons)					
				TSP	PM10	SO2	NOX	CO	VOC
2009	6773	121001	408408	36.19	3.08	1720.00	413.20	31.27	3.79
2010	6892	108321	69552	26.74	3.14	1608.10	409.70	27.25	2.60
2011	3565	57870	316134	14.74	1.62	826.70	218.40	15.28	1.86
2012	1936	25365	200110	6.40	0.88	365.70	92.60	6.87	0.84
2013	2418	38877	186480	9.51	1.10	621.00	143.40	10.29	1.24

2009/2010 Average									
Unit	Hours	Coal (tons)	Oil (gallons)	Annual Emissions (tons)					
				TSP	PM10	SO2	NOX	CO	VOC
SR4	7239	122463	321396	30.70	4.45	1737.25	422.10	31.43	3.80
SR6	6832	114661	238980	31.47	3.11	1664.05	411.45	29.26	3.20
TOTALS		**237124**	**560376**	**62.17**	**7.56**	**3401.30**	**833.55**	**60.69**	**6.99**

FILE REFERENCE NOTATION

Confidential Business Information received on 2/27/14 with application # 14-0081.
PSNH – Schiller Station AFS # 3301500012. Filed in VII. A. Confidential Business Information.

SUPPORTING CALCULATIONS
TOTAL FACILITY EMISSIONS FOR ARD-1
Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

POTENTIAL EMISSIONS

Pollutant	SR4	SR5	SR6	SRCT	SREG	Total
Hourly (lb/hr)						
SO_2	1,377.6	76.2	1,377.6	17.4	0.001	2,848.8
NO_X	287.5	54.0	287.5	261.0	1.3	891.3
CO	11.3	72.0	11.3	31.9	0.8	127.2
PM	17.3	7.2	17.3	29.0	0.9	71.6
$PM_{2.5}$	7.1	4.7	7.1	8.4	0.9	28.1
VOC	2.9	3.6	2.9	0.0	0.2	9.6
Annual (tons/yr)						
SO_2	6,033.9	333.8	6,033.9	47.0	0.0	12,448.5
NO_X	1,158.5	236.5	1,158.5	1,143.2	0.3	3,697.0
CO	88.7	315.4	88.7	106.2	0.2	599.3
PM	75.6	31.5	75.6	127.0	0.2	309.9
$PM_{2.5}$	31.0	20.5	31.0	127.0	0.2	209.7
VOC	12.8	15.8	12.8	2.7	0.0	44.1

2010 ACTUAL EMISSIONS

Pollutant	SR4	SR5	SR6	SRCT	SREG	Total
Op. Hours	7213	7811	6892	72.27	27.38	-
Hourly (lb/hr)						
SO_2	456.5	0.4	466.7	5.3	0.016	928.9
NO_X	115.3	42.6	118.9	92.8	23.7	393.2
CO	8.2	2.1	7.9	0.3	1.3	19.8
PM	7.9	0.7	7.8	0.5	16.4	33.2
$PM_{2.5}$	2.3	0.4	2.3	0.2	0.00018	5.2
VOC	1.0	3.4	0.8	0.043	3.3	8.5
ANNUAL (tons)						
SO_2	1,646.2	1.6	1,608.1	0.2	0.0002	3,256.1
NO_X	415.7	166.1	409.7	3.4	0.3	995.2
CO	29.5	8.2	27.3	0.4	0.0	65.4
PM	28.4	2.7	26.7	0.02	0.2	58.1
$PM_{2.5}$	8.2	1.7	7.8	0.01	0.000002	17.7
VOC	3.6	13.3	2.6	0.002	0.05	19.5

Notes:
1. Potential emissions for SR5 are from Temporary Permit TP-0085, reissued March 7, 2006, Table 5.
2. Potential emissions of PM, SO_2 and NO_X for SR4 and SR6 are from Title V Operating Permit TV-OP-053, March 9, 2007, Table 6 and TP-0106.
3. Potential emissions of CO and VOC based on AP-42 emission factors (see supporting calculations).
4. Average hourly emissions based on actual annual emissions divided by operating hours.

SUPPORTING CALCULATIONS
PM2.5 SAMPLE CALCULATIONS
Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

SR4 PM2.5 Potential Emissions - Biomass

$PM_{2.5}$ (lb/hr)	=	$PM_{2.5}$ Emission Factor (lb/MMBTU)	x	Biomass Cofiring (%)	x	Max Coal Combustion	x	Biomass Heat Content
1.15 lb/hr	=	0.034 lb/MMBTU	x	10%	x	22.5 tons/hr	x	15.0 MMBTU/ton
$PM_{2.5}$ (tons/yr)	=	$PM_{2.5}$ (lb/hr)	x	8,760 hours/yr	÷	2,000 lbs/ton		
5.03 tons/yr	=	1.15 lb/hr	x	8,760 hours/yr	÷	2,000 lbs/ton		

SR4 PM2.5 Potential Emissions - Coal

$PM_{2.5}$ (lb/hr)	=	PM Emission Limit (lb/MMBTU)	x	$PM_{2.5}$ Fraction (%)	x	Boiler Heat Input (MMBTU/hr)
16.65 lb/hr	=	0.10 lb/MMBTU	x	29%	x	574 MMBTU/hr
$PM_{2.5}$ (tons/yr)	=	$PM_{2.5}$ (lb/hr)	x	8,760 hours/yr	÷	2,000 lbs/ton
72.91 tons/yr	=	16.65 lb/hr	x	8,760 hours/yr	÷	2,000 lbs/ton

SR4 PM2.5 Potential Emissions - Oil

$PM_{2.5}$ (lb/hr)	=	PM Emission Limit (lb/MMBTU)	x	$PM_{2.5}$ Fraction (%)	x	Boiler Heat Input (MMBTU/hr)
23.58 lb/hr	=	0.10 lb/MMBTU	x	41%	x	575 MMBTU/hr
$PM_{2.5}$ (tons/yr)	=	$PM_{2.5}$ (lb/hr)	x	8,760 hours/yr	÷	2,000 lbs/ton
103.26 tons/yr	=	23.58 lb/hr	x	8,760 hours/yr	÷	2,000 lbs/ton

SR4 PM2.5 Actual Emissions - Biomass

$PM_{2.5}$ (lb/year)	=	$PM_{2.5}$ Emission Factor (lb/MMBTU)	x	Biomass Cofiring (tons/yr)	x	Biomass Heat Content (MMBTU/ton)
91.80 lb/yr	=	0.034 lb/MMBTU	x	180 tons	x	15.0 mmbtu/ton
$PM_{2.5}$ (lb/hr)	=	$PM_{2.5}$ (lb/yr)	÷	operating hours/yr		
0.01 lb/hr		91.80 lb/yr	÷	7,213 hours/yr		
$PM_{2.5}$ (ton/yr)	=	$PM_{2.5}$ (lb/yr)	÷	2,000 lbs/ton	÷	2,000 lbs/ton
0.05 tons/yr	=	91.80 lb/hr	÷	2,000 lbs/ton		

SUPPORTING CALCULATIONS
PM2.5 SAMPLE CALCULATIONS
Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

SR4 PM2.5 Actual Emissions - Coal

$PM_{2.5}$ (tons/yr)	=	PM Emission Factor (lb/MMBTU)	x	$PM_{2.5}$ Fraction (%)	x	Coal Heat Input (MMBTU/yr)		
8.23 tons/yr	=	0.02 lb/MMBTU	x	29%	x	2,838,262 MMBTU/yr	÷	2,000 lbs/ton
$PM_{2.5}$ (lb/hr)	=	$PM_{2.5}$ (tons/yr)	x	2,000 lbs/ton	÷	operating hours/yr		
2.28 lb/hr	=	8.23 tons/yr	x	2,000 lbs/ton	÷	7,213 hours/yr		

SR4 combusted 114,928 tons of coal in 2010 with an average heat content of 12,348 BTU/lb

SR4 PM2.5 Actual Emissions - Oil

$PM_{2.5}$ (tons/yr)	=	PM Emission Factor (lb/MMBTU)	x	$PM_{2.5}$ Fraction (%)	x	Fuel Use (1000 gal/yr)	x	1 - ESP Control Efficiency (%)
			÷	2,000 lbs/ton				
0.006 tons/yr	=	12.41 lb/1000 gal	x	41%	x	300.594 Mgal/yr	x	0.8%
			÷	2,000 lbs/ton				
$PM_{2.5}$ (lb/hr)	=	$PM_{2.5}$ (tons/yr)	x	2,000 lbs/ton	÷	operating hours/yr		
0.002 lb/hr	=	0.006 tons/yr	x	2,000 lbs/ton	÷	7,213 hours/yr		

SR4 combusted 300,595 gallons of #6 fuel oil in 2010 with an sulfur content of 1.0% by weight
ESP Control efficiency is 99.2%

AP-42 PM (lb/1000 gal)	=	9.19	x	Weight % Sulfur	+	3.22
12.41 lb/1000 gal		9.19	x	1.0	+	3.22

STURTEVANT®
348 Circuit Street Hanover, MA 02339
Ph: 800-992-0209 781-829-6501
www.sturtevantinc.com
Fax: 781-829-6515

Particle Size Analysis Report

Instrument: MALVERN MASTERSIZER 2000

Machine Tested: Evergreen Power Trona Sample. ECP-1000 Lbs/Hr, Bag Catch

Measured: Friday, April 01, 2011 11:43:18 AM

Customer / Clyde Bergemann

Record No: 2

Particle Name: Trona

Sample bulk lot ref:

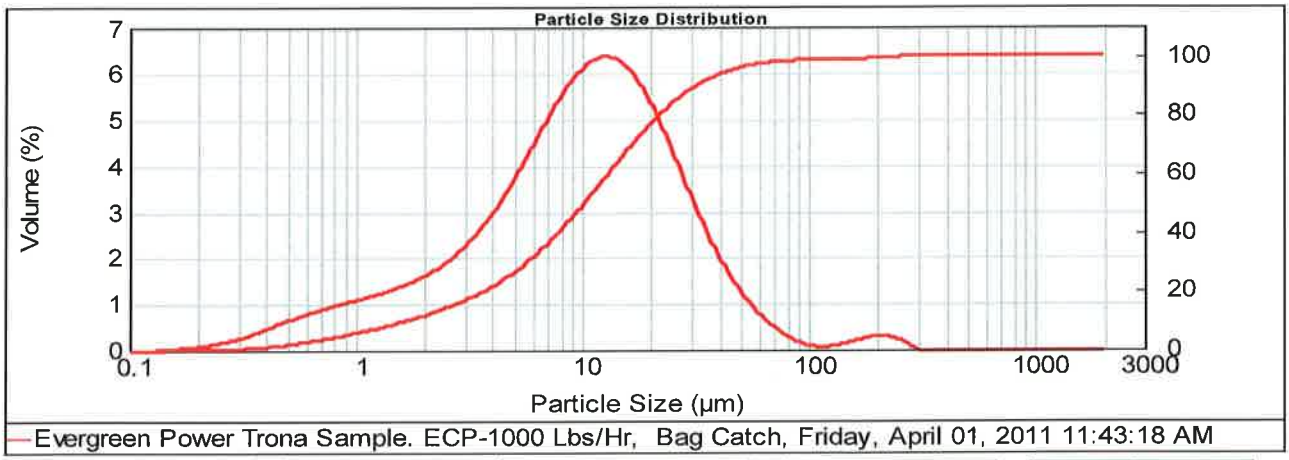
Measured by: B. MacNeil

Result Source: Measurement

Particle RI:	0.000	**Accessory Name:**	Scirocco 2000	**Obscuration:**	4.45 %
Absorption:	0	**Analysis model:**	General purpose	**Residual:**	2.857
Dispersant Name:	Dry dispersion	**Size range:**	0.020 to 2000.000 um	**Weighted Residual:**	0.150 %
Dispersant RI:	1.000	**Result Emulation:**	Off	**Result units:**	Volume

Concentration:	0.0006 %Vol	**Vol. Weighted Mean D[4,3]:**	15.808 um	**Specific Surface Area:**	1.61 m²/g
Span :	2.959	**Uniformity:**	1.1	**Surface Weighted Mean D[3,2]:**	3.729 um

d(0.1): 1.632 um **d(0.5): 10.091 um** **d(0.9): 31.490 um**



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.182	0.06	3.311	18.58	60.256	97.54	1096.478	100.00
0.011	0.00	0.209	0.13	3.802	20.98	69.183	98.11	1258.925	100.00
0.013	0.00	0.240	0.24	4.365	23.73	79.433	98.47	1445.440	100.00
0.015	0.00	0.275	0.40	5.012	26.89	91.201	98.67	1659.587	100.00
0.017	0.00	0.316	0.62	5.754	30.52	104.713	98.77	1905.461	100.00
0.020	0.00	0.363	0.91	6.607	34.62	120.226	98.84	2187.762	100.00
0.023	0.00	0.417	1.31	7.586	39.21	138.038	98.92	2511.886	100.00
0.026	0.00	0.479	1.82	8.710	44.24	158.489	99.07	2884.032	100.00
0.030	0.00	0.550	2.42	10.000	49.63	181.970	99.29	3311.311	100.00
0.035	0.00	0.631	3.12	11.482	55.28	208.930	99.56	3801.894	100.00
0.040	0.00	0.724	3.90	13.183	61.04	239.883	99.81	4365.158	100.00
0.046	0.00	0.832	4.76	15.136	66.74	275.423	99.99	5011.872	100.00
0.052	0.00	0.955	5.69	17.378	72.22	316.228	100.00	5754.399	100.00
0.060	0.00	1.096	6.69	19.953	77.31	363.078	100.00	6606.934	100.00
0.069	0.00	1.259	7.76	22.909	81.87	416.869	100.00	7585.776	100.00
0.079	0.00	1.445	8.91	26.303	85.82	478.630	100.00	8709.636	100.00
0.091	0.00	1.660	10.16	30.200	89.13	549.541	100.00	10000.000	100.00
0.105	0.00	1.905	11.51	34.674	91.80	630.957	100.00		
0.120	0.00	2.188	12.99	39.811	93.90	724.436	100.00		
0.138	0.00	2.512	14.64	45.709	95.50	831.764	100.00		
0.158	0.02	2.884	16.49	52.481	96.69	954.993	100.00		

The above data is to indicate the effectiveness of Sturtevant equipment. Due to the differences in particle size analysis technology, it is recommended that this data be confirmed using your specific method of analysis.

Operator Notes: 2 Bar pressure.

STURTEVANT®
348 Circuit Street Hanover, MA 02339 www.sturtevantinc.com
Ph: 800-992-0209 781-829-6501 Fax: 781-829-6515

Particle Size Analysis Report

Instrument: MALVERN MASTERSIZER 2000

Machine Tested: Evergreen Power Trona Sample. ECP-3000 Lbs/Hr, Bag Catch

Measured: Friday, April 01, 2011 11:47:02 AM

Customer / Clyde Bergemann

Record No: 3

Particle Name: Trona

Sample bulk lot ref:

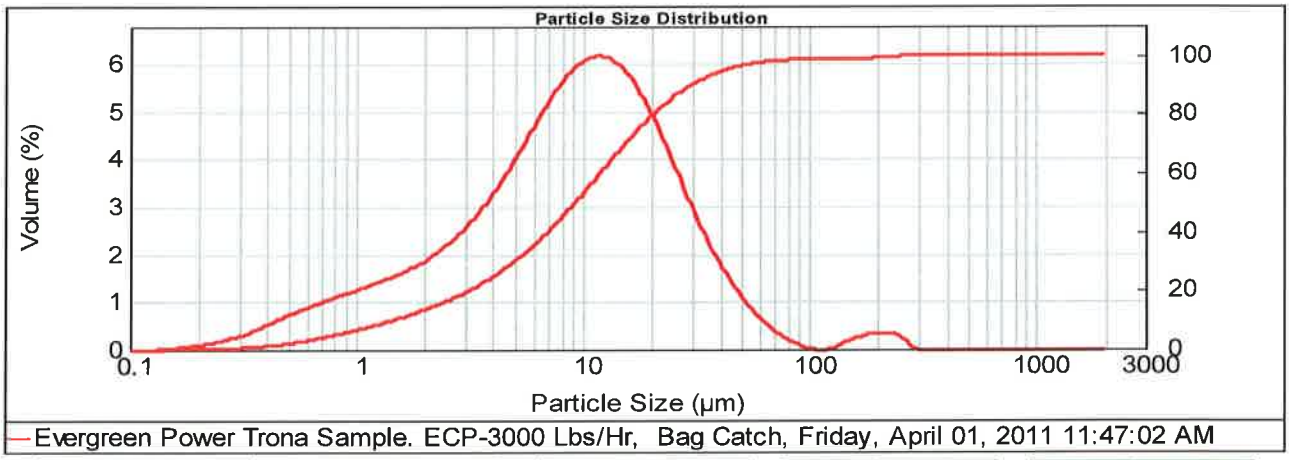
Measured by: B. MacNeil

Result Source: Measurement

Particle RI:	0.000	**Accessory Name:**	Scirocco 2000	**Obscuration:**	4.25 %
Absorption:	0	**Analysis model:**	General purpose	**Residual:**	3.919
Dispersant Name:	Dry dispersion	**Size range:**	0.020 to 2000.000 um	**Weighted Residual:**	0.179 %
Dispersant RI:	1.000	**Result Emulation:**	Off	**Result units:**	Volume

Concentration:	0.0005 %Vol	**Vol. Weighted Mean D[4,3]:**	14.904 um	**Specific Surface Area:**	1.76 m²/g
Span :	3.068	**Uniformity:**	1.16	**Surface Weighted Mean D[3,2]:**	3.409 um

d(0.1): 1.431 um **d(0.5): 9.170 um** **d(0.9): 29.570 um**



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
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The above data is to indicate the effectiveness of Sturtevant equipment. Due to the differences in particle size analysis technology, it is recommended that this data be confirmed using your specific method of analysis.

Operator Notes: 2 Bar pressure.

T-200®

Trona: T-200®

Material Safety Data Sheet

Chemical: Sodium Sesquicarbonate

NFPA: H=1 F=0 I=0 S= None
HMIS: H=1 F=0 R=0 PPE= Supplied by user; dependent on conditions

MSDS Number: Trona-1103
Effective Date: 11 November 2003
Issued by: Solvay Chemicals, Inc. Regulatory Affairs Department

Not valid three years after effective date or after issuance of superseding MSDS, whichever is earlier. French or Spanish translations of this MSDS may be available. Check www.solvaychemicals.us or call Solvay Chemicals, Inc. to verify the latest version or translation availability.

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of Solvay Chemicals, Inc. in North America. If you are located in a country other than Canada , Mexico, or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location.

1. Company and Product Identification

1.1 Product Name: T-200®
Chemical Name: Sodium sesquicarbonate
Synonyms: Mechanically refined trona.
Chemical Formula: $Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$
Molecular Weight: 226
CAS Number: 533-96-0
EINECS Number: 208-580-9
Grades/Trade Names: T-200®

1.2 Recommended Uses: Consult supplier

1.3 Supplier: Solvay Chemicals, Inc.
PO BOX 27328 Houston, TX 77227-7328
3333 Richmond Ave. Houston, Texas 77098

1.4 Emergency Telephone Numbers
Emergencies (USA): 1-800-424-9300 (CHEMTREC®)
Transportation Emergencies (INTERNATIONAL/MARITIME): 1-703-527-3887 (CHEMTREC®)
Transportation Emergencies (CANADA): 1-613-996-6666 (CANUTEC)
Transportation Emergencies (MEXICO-SETIQ): 01-800-00-214-00 (MEX. REPUBLIC)
525-559-1588 (Mexico City and metro area))

Responsible Care®
Good Chemistry at Work

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www.solvaychemicals.us 1.800.765.8292

Solvay Chemicals

SOLVAY

Interox, Fluorides & Minerals

2. Composition/Information on Ingredients

INGREDIENTS	FORMULA	WT. PERCENT	CAS #	EINECS #
Sodium sesquicarbonate	$Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$	98	533-96-0	208-580-9
Silica, crystalline quartz	SiO_2	<0.4	14808-60-7	238-878-4
H_20 insolubles	Not Applicable	2	Not Applicable	Not Applicable

3. Hazards Identification

Emergency Overview: Product reacts with acids to produce carbon dioxide and heat.

3.1 Route of Entry: Inhalation: Yes Skin: Yes Ingestion: Yes

3.2 Potential Effects of exposure: Sodium Sesquicarbonate is an alkaline product and may irritate digestive mucous membranes, eyes and healthy skin.

Inhalation: May be irritating to the nose, throat, and respiratory tract. Repeated exposure may cause nosebleeds.

Eyes: May cause irritation, severe watering and redness.

Skin contact: May cause skin irritation, seen as redness and swelling. In the presence of moisture or sweat, irritation may become more severe leading to rash.

Ingestion: May cause gastrointestinal irritation including nausea, vomiting, abdominal cramps and diarrhea. May cause irritation of the mouth and throat.

Carcinogenicity: See section 11.3

4. First-Aid Measures

General Recommendations: Treat for eye, skin and respiratory tract irritation.

4.1 Inhalation: Remove subject to a dust free environment and blow nose. If breathing is difficult or has stopped, administer artificial respiration. If any irritation is present, seek medical attention.

Eyes: In cases of splashing of concentrated solution in the eyes and face, treat the eyes first, and then continue first aid as defined under "contact with the skin." Rinse the eyes with running water for 15 minutes, maintaining the eyelids wide open to eliminate the product. Protect the eyes from strong light. Consult a physician or ophthalmologist in all cases.

Skin:

- Remove contaminated shoes, socks and clothing, under a shower if necessary; wash the affected skin with luke warm water.
- Keep warm (blanket), provide clean clothes.
- Consult with a physician in all cases.
- Dry carefully.
- In case of persistant pain or reddening, consult physician.

Ingestion: Do not induce vomiting. Remove any evidence of the product from the person's mouth.

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If the subject is completely conscious: Give 8-12 ounces of water.
SEEK MEDICAL ATTENTION.

If the subject is unconscious:
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSIOUS PERSON.

5. Fire-Fighting Measures

5.1 **Flash point:** Non combustible.

5.2 **Auto-ignition Temperature**: Not Applicable.

5.3 **Flammability Limits:** Not Applicable.

5.4 **Unusual Fire and Explosion Hazards:** Non-combustible and non-explosive.

5.5 **Common Extinguishing Methods:** In case of fire near stored product, all means of extinguishing are acceptable.

6. Accidental Release Measures

6.1 **Precautions:** Avoid excessive dust.

6.2 **Cleanup methods:** Clean up uncontaminated material and recycle into process. Place unusable material into a closed, labeled container compatible with the product.

6.3 **Precautions for protection of the environment:** Sweep up residual material. Do not flush to drain. Prevent material from entering public sewer systems or any waterways. Dispose of waste in accordance with applicable federal, state, and local environmental laws and regulations.

7. Handling and Storage

7.1 **Handling:**
- Avoid prolonged or repeated contact with the skin or eyes.
- Do not wear contact lenses without proper eye protection when using this product.
- Avoid prolonged or repeated breathing of dusts.
- Use vacuum or wet mop to clean up dust.

7.2 **Storage:** Keep in a closed, properly labeled container in a dry area away from acids. Protect from physical damage.

7.3 **Specific Uses:** See Section 1.2

7.4 **Packaging:**
- Bulk rail car and truck
- Paper+PE
- Woven plastic material + PE coating
- Woven plastic material + PE.

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8. Exposure Controls/Personal Protection

8.1 Exposure Limit Values	TLV® ACGIH®-USA (2002)	OSHA PEL
Sodium Sesquicarbonate		Nuisance Dust-5 mg/m³ (Respirable Fraction), 15 mg/m³ (Total Dust).
Silica, Crystalline Quartz	0.05 mg/m³ for 8 hourTWA	10 mg/m³ / % Silica + 2

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.

8.2 Exposure Controls:

8.2.1 Occupational Exposure Controls:

8.2.1.1 Ventilation: In places with the possibility for creating excessive dust in excess of exposure limits, ventilation should be provided.

8.2.1.2 Respiratory protection: In case of significant or accidental dust emissions, a NIOSH/MSHA approved dust respirator should be worn.

8.2.1.3 Hand protection: Cotton gloves are adequate for routine handling of dry product.

8.2.1.4 Eye protection: In cases of significant dust, dust proof goggles are recommended.

8.3 Other precautions: Protective clothing in dusty areas. An eyewash and safety shower should be nearby and ready for use. Use good hygiene practices when handling this product including changing work clothes after use. Do not eat, drink or smoke in areas where this material is handled.

9. Physical and Chemical Properties

9.1 Appearance: Powder

Color: White to off white

Odor: Odorless

9.2 Important Health, Safety and Environmental information:
pH: 10.1 (1-% solution).

Change of state:
Melting point: Decomposes at >70°C (158°F).
Boiling point: Not applicable.
Decompositon Temperature: Beginning at 70°C (158°F).

Flash Point: Not Applicable

Flammability: Not Applicable
(solid, gas)

Explosive Properties: Not Applicable

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Oxidizing Properties: Not Applicable
Vapor Pressure: Not Applicable

Relative Density: Specific gravity (H_2O=1): 2.11

Solubility:
Water: 20% maximum by weight in water @ 30°C (86°F).
Fat: Not Applicable.

Partition coefficient: P (n-octanol/water): Not applicable.

Viscosity: Not listed

Vapor Density (air=1): Not Applicable.

Evaporation Rate: Not Applicable.

9.3 Other Information:

Bulk Density: 49 lbs./ft^3 (780 kg/m^3)

10. Stability and Reactivity

Stability: Stable at ambient temperature and atmospheric pressure.

10.1 Conditions to avoid:
- Protect from moisture
- Mixing of acid, oxidizing agents and sodium sesquicarbonate solutions could cause CO_2 evolution and may cause severe splattering.

10.2 Materials and substances to avoid: Sodium sesquicarbonate mixed with lime dust in the presence of moisture will form caustic soda, which can cause serious burns. When heated, may react with Aluminum (Al). Reacts with acids and releases large volumes of CO_2 gas and heat.

10.3 Hazardous decomposition products: Carbon dioxide (CO_2) is evolved when mixed with acids and oxidizing agents.

10.4 Hazardous Polymerization: None.

10.5 Other information: None.

11. Toxicological Information

11.1 Acute toxicity:
Inhalation: LC_{50} 2300 mg/m^3/2h(sodium carbonate) species: rat.
Oral: LD_{50} 4090 mg/kg (sodium carbonate) species: rat.

Dermal: LD_{50}, rabbit, >2,000 mg/kg (sodium carbonate)

11.2/11.3 Chronic toxicity/ Carcinogenic Designation: This product contains less than 0.4% Silica, crystalline quartz. Silica, crystalline quartz at greater than 1% has been shown to cause silicosis, a progressive lung disease. Silica is a suspected carcinogen.

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12. Ecological Information

12.1 Acute ecotoxicity:
SODIUM BICARBONATE: **Crustaceans**, Daphnia magna, LC_{50}, 48 hours, 2350 mg/l.
Fishes, Gambusia affinis, LC_{50}, 96 hours, 7550 mg/l.

SODIUM CARBONATE: **Crustaceans**, Daphnia sp., LC_{50}, 48 hours, from 115 to 150 mg/l.
Fishes, various species, LC_{50}, 96 hours, from 30 to 1,200 mg/l.

12.2 Chronic ecotoxicity: None listed.

12.3 Mobility: Water-Considerable solubility and motility.

12.4 Degradation
Abiotic:
- Water, hydrolysis. Degradations products: Carbonate (pH.10/bicarbonate (pH 6-10)/carbonic acid/carbon dioxide (pH<6)
- Soil-Result: Hydrolysis as a function of pH.

Biotic: Not Applicable.

12.5 Potential for bioaccumulation: Not Applicable.

12.6 Other adverse effects /Comments: Observed effects are related to alkaline properties of product. Product is not significantly hazardous for the environment.

13. Disposal Considerations

13.1 Waste treatment: T-200 is not a listed hazardous waste under 40 CFR 261. However, state and local regulations for waste disposal may be more restrictive. Spilled product should be disposed of in an EPA approved disposal facility in accordance with applicable national, state and local environmental laws and regulations.

13.2 Packaging treatment: To avoid treatments, use dedicated containers where possible. Rinse the empty containers and treat the effluent in the same way as waste. Consult current federal, state and local regulations regarding the proper disposal of emptied containers.

13.3 RCRA Hazardous Waste: Not Listed.

14. Transport Information

Mode	DOT	IMDG	IATA
UN Number	Not a regulated hazardous material	Not a regulated hazardous material	Not a regulated hazardous material
Other	It is recommended that ERG guide # 111 be used for all non DOT regulated material.		
STCC #:	28-123-87		

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15. Regulatory Information

National Regulations (US)

TSCA Inventory 8(b): Yes

SARA Title III Sec. 302/303 Extremely Hazardous Substances (40 CFR355): No

SARA Title III Sec. 311/312 (40 CFR 370:

Hazard Category:
- Acute and Chronic health hazard
- Threshold planning quantity - 10,000 lbs

SARA Title III Sec. 313 Toxic Chemical Emissions Reporting (40 CFR 372): No

CERCLA Hazardous Substance (40CFR Part 302)

Listed: No
Unlisted Substance: No

State Component Listing: None identified

National Regulations (Canada)

Canadian DSL Registration: Yes

WHMIS Classification: Not Applicable

This product has been classified in accordance with the hazard criteria of the ***Controlled Products Regulations*** and the MSDS contains all the information required by the ***Controlled Products Regulations.***

Labeling according to Directive 1999/45/EC.

Name of dangerous products-sodium sesquicarbonate

Symbols	**Xi**	**Irritant**
Phrases R	36	Irritating to eyes

16. Other Information

16.1 Ratings:

NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

Health = 1 Fire = 0 Instability = 0 Special = none

HMIS (HAZARDOUS MATERIAL INFORMATION SYSTEM)

Health = 1 Fire = 0 Reactivity = 0 PPE = Supplied by User; dependent on local conditions

16.2 Other Information:

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

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16.3 Reason for revision:
Supersedes edition: Solvay Minerals MSDS #015 dated 4/9/03.
Purpose of revision: Change Company name and MSDS format.

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Material Safety Data Sheet

U.S. Department of Labor
Occupational Safety and Health Administration
This form is consistent with ANSI standard for preparation of MSDS's in accordance with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

Product Type: **FLUEPAC MC PLUS**	
Product Code: 2169	Profile No: 51

SECTION I

Company Identification (USA)	Calgon Carbon Corporation P.O. Box 717 Pittsburgh, PA 15230-0717	
Telephone Number(s)	Information	412-787-6700
	Emergency	412-787-6700
Company Identification (Europe)	Chemviron Carbon Zoning Industriel de Feluy B-7181 Feluy, Belgium	
Telephone Number(s)	Information	32 64 51 18 11
	Emergency	32 64 51 18 11

Date Prepared: November 3, 2008	Signature of Preparer: (optional)	

SECTION II – COMPOSITION /INFORMATION ON INGREDIENTS

Nonhazardous components are listed at 3% or greater; acute hazards are listed when present at 1% or greater and chronic hazards are listed when present at 0.01% or greater. This is not intended to be a complete compositional disclosure.

Ingredient / Component	CAS No	% by Wt
Steam Activated Carbon	7440-44-0	> 85
Proprietary component	proprietary	< 15

SECTION III – HAZARD(S) IDENTIFICATION

Emergency Overview: Caution! May be harmful if swallowed or inhaled. May cause irritation to skin, eyes, and respiratory tract.			
OSHA Regulatory Status:			
HMIS Ratings: (NFPA)	Health	2	4 = Extreme/Severe 3 = High/Serious 2 = Moderate 1 = Slight 0 = Minimum w = Water Reactive ox = oxidizer
	Flammability	0	
	Reactivity	1	
	Special		
Protective Equipment	See Section VIII		
Health Effects:	See Section IV		
Environmental Effects:	See Section XII		

SECTION IV – FIRST-AID MEASURES

Route of exposure	
Eyes	Moderately irritating to the eyes
Inhalation	Moderately irritating to respiratory tract
Skin	Moderately irritating to the skin
Ingestion	Ingestion may cause gastrointestinal irritation and diarrhea
Signs/Symptoms of Exposure	Irritant to eyes, skin and respiratory track. Long term ingestion may cause depression, psychoses, irritability, and headache.
Emergency and First Aid Procedures	Rinse eyes with water. Supply fresh air. Wash skin with soap and water. Seek medical advice.
Medical Conditions Generally Aggravated by Exposure	Repeated exposure may cause irritation or dermatitis.

SECTION V – FIRE FIGHTING MEASURES

Suitable Extinguishing Media	Use an extinguishing media suitable for surrounding fire
Unsuitable Extinguishing Media	Not known
Specific Hazards	Not available
Protective Equipment and Procedures	Wear self-contained breathing respirator. Wear full protective suit

SECTION VI – ACCIDENTAL RELEASE MEASURES

Personal Precautions	Wear protective equipment, keep unnecessary personnel away, ventilate area of spill
Environmental Precautions	Avoid dispersal of spilled material, runoff and contact with soil, waterways, drains and sewers.
Containment & Clean-up	Vacuum or scoop up spilled material and place in appropriate container for disposal by incineration. Avoid creating dusty
Other information	

SECTION VII – HANDLING AND STORAGE

Handling	Avoid contact with eyes and skin. Protect containers from physical damage.
Storage	Keep container closed and store in a cool, dry ventilated area. There are no special precautions.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Component	OSHA PEL	ACGIH TLV	Other limits
Activated Carbon	Non Defined	Non Defined	
Proprietary Component	Non Defined	Non Defined	

Exposure Guidelines	Not defined
Engineering Controls	No special ventilation requirements. Good general ventilation should be adequate
Personal Protective Equipment	The usual precautionary measures for handling chemicals should be followed, i.e. safety glasses w/side shields, long sleeve lab coat, dust respirator if dusty, etc
General Hygiene	The usual precautionary measures for handling chemicals should be followed, i.e. Keep away from food and beverage, remove contaminated clothing immediately, wash hands before breaks or eating, avoid contact with eyes and skin, etc.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point	NA	Melting Point	NA
Vapor Pressure (mm Hg.)	0	Evaporation Rate	NA
Vapor Density (AIR = 1)	solid	Flash Point	NA
Specific Gravity	0.4 – 0.8	UEL	NA
		LEL	NA
Flammability Limits	Ignition Temperature > 220° C		
Odor	None		
Solubility in Water	Soluble impregnant		
Appearance	Black granular material		

SECTION X – STABILITY AND REACTIVITY

STABILITY	UNSTABLE		CONDITIONS TO AVOID:
	STABLE	YES	None
HAZARDOUS REACTION	MAY OCCUR		CONDITIONS TO AVOID:
	WILL NOT OCCUR	YES	None
Incompatible Materials			Avoid oxidizing materials and acids
Hazardous Decomposition Products			Product contains halogenated compounds.

SECTION XI – TOXICOLOGICAL INFORMATION

Acute Effects		
Toxicity Studies	Oral LD_{50}	For 100% proprietary component (LD 50 Rat) = 3120 mg/kg
	Dermal LD_{50}	Not determined
Inhalation:	See section IV	
Ingestion:	See section IV	
Eye Irritation:	See section IV	
Skin Irritation:	See section IV	
Sensitization:	None determined	
Target Organ (s) or System		Central Nervous System
Signs and symptoms of Exposure		See Section IV
Chronic Effects		
Carcinogenicity:	No	
Mutagenicity:	None determined	
Reproductive Effects:	None determined	
Developmental Factors:	None determined	

SECTION XII – ECOLOGICAL INFORMATION

Ecotoxicity:	No known significant effects or critical hazards.
Persistence/degradability:	The product and its degradation products have not been determined to be toxic
Bioaccumulation/Accumulation:	Not determined
Mobility in Environmental Media:	Not determined
Other Adverse Effects:	

SECTION XIII – DISPOSAL CONSIDERATIONS

Sweep, shovel or vacuum carbon into a closed container. Avoid dispersal and contact with soil, waterways, drains and sewers.
Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

SECTION XIV – TRANSPORT INFORMATION

The information as presented below only applies to the material as shipped. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Land	DOT Regulations	Proper Shipping Description:	FLUEPAC MC Plus (Steam Activated Carbon)
	Canadian WHMIS	Hazard Class:	
		UN/NA:	
		Information reported for product/size:	
Water	IMO / IMDG	Proper Shipping Description:	FLUEPAC MC Plus (Steam Activated Carbon)
		Hazard Class:	
		UN/NA:	
		Information reported for product/size:	
Air	IACO / IATA	Proper Shipping Description:	FLUEPAC MC Plus (Steam Activated Carbon)
		Hazard Class:	
		UN/NA:	
		Information reported for product/size:	

This product has been tested according to the *United Nations Transport of Dangerous Goods* test protocol for spontaneously combustible materials. It has been specifically determined that this product does not meet the definition of a self heating substance or any hazard class, and therefore is not a hazardous material and not regulated.

SECTION XV – REGULATORY INFORMATION

SARA Title III 302:	No	
SARA Title III 313:	No	
TSCA 8 (d)	No	
OSHA	No	
Canadian classification	WHMIS	No
	DSL #	No
EEC Council Directives relating to the classification, packaging, and labeling of dangerous substances and preparations.		
Risk Phrases	R36 Irritating to eyes, R37 Irritating to respiratory system, R38 Irritating to skin,	
Safety Phrase	S22 Do not breath dust, S25 Avoid contact with eyes, S36 Wear suitable protective clothing	

SECTION XVI – OTHER INFORMATION

Intended Use:	The material is generally used for treatment of liquids and/or gases.
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.	
While the information and recommendations set forth herein are believed to be accurate as of the date hereof, Calgon Carbon Corporation makes no warranty with respect to same and disclaims all liability for reliance there on.	

References:

NA not applicable

Legend:

ACGIH - American Conference of Governmental Industrial Hygienists
ANSI - American National Standards Institute
C - Ceiling (limit value)
CAS # - Chemical Abstracts Service Registry Number
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CEPA - Canadian Environmental Protection Act
CFR - Code of Federal Regulations
DOT - Department of Transportation
DSL - Domestic Substances List
EINECS - European Inventory of Existing Commercial Chemical Substances
ERAP - Emergency Response Assistance Plan

IATA	- International Air Transportation Association
IARC	- International Agency for Research on Cancer
ICAO	- International Civil Aviation Organization
IDLH	- Immediately Dangerous to Life and Health
IMO	- International Maritime Organization
IMDG	- International Maritime Dangerous Goods
LC_{50}	- The concentration of material in air expected to kill 50% of a group of test animals
LD_{50}	- Lethal Dose expected to kill 50% of a group of test animals
NFPA	- National Fire Protection Association
NIOSH	- National Institute for Occupational Safety and Health
NTP	- National Toxicology Program
OSHA	- Occupational Safety and Health Association
PEL	- Permissible Exposure Limit
RCRA	- Resource conservation and Recovery Act
RQ	- Reportable Quantity
SARA	- Superfund Amendments and Reauthorization Act
STEL	- Short Term Exposure Limit
TDG	- Transportation of Dangerous Goods Act/Regulation
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
TWA	- Time Weighted Average
WHMIS	- Workplace Hazardous Material Information System

* * * END OF MATERIAL SAFETY DATA SHEET * * *

SAFETY DATA SHEET
North American Version

SOLVAIR® SELECT S300 & SELECT 350

1. PRODUCT AND COMPANY IDENTIFICATION

1.1. Identification of the substance or preparation

Product name	:	SOLVAIR® SELECT S300 & SELECT 350
Product grade(s)	:	SOLVair® Select 300 SOLVair® Select 350
Molecular Weight	:	84.02 g/mol

1.2. Use of the Substance/Preparation

Recommended use	:	- Purifying flue gas

1.3. Company/Undertaking Identification

Address	:	SOLVAY CHEMICALS, INC. 3333 RICHMOND AVENUE HOUSTON TX 77098-3099 United States

1.4. Emergency and contact telephone numbers

Emergency telephone	:	**1 (800) 424-9300 CHEMTREC ® (USA & Canada)** **01-800-00-214-00 (MEX. REPUBLIC)**
Contact telephone number (product information):	:	**US: +1-800-765-8292 (Product information)** **US: +1-713-525-6500 (Product information)**

2. HAZARDS IDENTIFICATION

2.1. Emergency Overview:

NFPA	:	H= 0 F= 0 I= 0 S= None
HMIS	:	H= 0 F= 0 R= 0 PPE = Supplied by User; dependent on local conditions

General Information

Appearance	:	crystalline, powder
Colour	:	white
Odour	:	odourless

2.2. Potential Health Effects:

Inhalation
- Mechanical irritation from the particulates generated by the product.

Eye contact
- Mechanical irritation from the particulates generated by the product.

Skin contact
- Mechanical irritation from the particulates generated by the product.

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SOLVAY
Chemicals

SOLVAY

Ingestion
- Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Other toxicity effects
- See section 11: Toxicological Information

2.3. Environmental Effects:
- See section 12: Ecological Information

3. COMPOSITION/INFORMATION ON INGREDIENTS

Sodium bicarbonate

CAS-No.	:	144-55-8
Concentration	:	>= 95.0 %

4. FIRST AID MEASURES

4.1. Inhalation
- Remove to fresh air.

4.2. Eye contact
- Rinse thoroughly with plenty of water, also under the eyelids.
- If eye irritation persists, consult a specialist.

4.3. Skin contact
- Wash off with plenty of water.

4.4. Ingestion
- If a large amount is swallowed, get medical attention.

If victim is conscious:
- If swallowed, rinse mouth with water (only if the person is conscious).

If victim is unconscious but breathing:
- not applicable

5. FIRE-FIGHTING MEASURES

5.1. Suitable extinguishing media
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Extinguishing media which shall not be used for safety reasons
- None.

5.3. Special exposure hazards in a fire
- Not combustible.

5.4. Hazardous decomposition products
- none

5.5. Special protective equipment for fire-fighters
- No special precautions required.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions
- Refer to protective measures listed in sections 7 and 8.

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6.2. Environmental precautions

- Do not flush into surface water or sanitary sewer system.
- Prevent any mixture with an acid into the sewer/drain (gas formations).

6.3. Methods for cleaning up

- Sweep up and shovel into suitable containers for disposal.
- Avoid dust formation.
- Keep in properly labelled containers.
- Keep in suitable, closed containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".

7. HANDLING AND STORAGE

7.1. Handling

- Keep away from incompatible products.

7.2. Storage

- Keep in a dry place.
- Store in original container.
- Keep container closed.
- Keep away from incompatible products.

7.3. Packaging material

- Paper + PE.
- Polyethylene
- Polypropylene
- Woven plastic material + PE.

7.4. Other information

- Avoid dust formation.
- Refer to protective measures listed in sections 7 and 8.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Exposure Limit Values

Sodium bicarbonate

- SAEL (Solvay Acceptable Exposure Limit) 2007
  TWA = 10 mg/m3
- US. ACGIH Threshold Limit Values
  Remarks: none established

Particles not otherwise specified (PNOS)

- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 5 mg/m3
  Remarks: respirable dust fraction, All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 15 mg/m3
  Remarks: Total dust, All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 15 millions of particles per cubic foot of air

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Remarks: respirable dust fraction
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 50 millions of particles per cubic foot of air
  Remarks: Total dust
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. ACGIH Threshold Limit Values 2008
  time weighted average = 10 mg/m3
  Remarks: Inhalable particles.
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.
SAEL = Solvay Acceptable Exposure Limit, Time Weighted Average for 8 hour workdays. No Specific TLV STEL (Short Term Exposure Level) has been set. Excursions in exposure level may exceed 3 times the TLV TWA for no more than a total of 30 minutes during a workday and under no circumstances should they exceed 5 times the TLV TWA.

8.2. Engineering controls
- Ensure adequate ventilation.
- Provide appropriate exhaust ventilation at places where dust is formed.
- Refer to protective measures listed in sections 7 and 8.
- Apply technical measures to comply with the occupational exposure limits.

8.3. Personal protective equipment

8.3.1. Respiratory protection
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.

8.3.2. Hand protection
- Wear suitable gloves.

8.3.3. Eye protection
- Dust proof goggles, if dusty.

8.3.4. Skin and body protection
- None.

8.3.5. Hygiene measures
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

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9.1. General Information

Appearance	:	crystalline, powder
Colour	:	white
Odour	:	odourless

9.2. Important health safety and environmental information

pH	:	8.6 *Concentration*: 52 g/l
Boiling point/boiling range	:	*Remarks*: not applicable, Thermal decomposition
Flash point	:	*Remarks*: not applicable
Flammability	:	*Lower explosion limit*: *Remarks*: The product is not flammable.
Explosive properties	:	*Explosion danger*: *Remarks*: Not explosive
Oxidizing properties	:	*Remarks*: Non oxidizer
Vapour pressure	:	*Remarks*: not applicable
Bulk density	:	500 - 1,200 kg/m3
	:	32 - 75 lb/ft3
Solubility	:	Water 96 g/l *Temperature*: 20 °C (68 °F)
	:	Other
	:	slightly soluble
	:	Alcohol
Partition coefficient: n-octanol/water	:	*Remarks*: not applicable
Viscosity	:	1.2 mPa.s
Vapour density	:	*Remarks*: not applicable

9.3. Other data

Melting point/range	:	*Remarks*: not applicable, Decomposition
Auto-flammability	:	*Remarks*: The product is not flammable.
Decomposition temperature	:	> 60 °C (140 °F)

10. STABILITY AND REACTIVITY

10.1. Stability

- Stable under recommended storage conditions.

10.2. Conditions to avoid

- Keep at temperature not exceeding: 60 °C (140 °F)

10.3. Materials to avoid

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- Acids

10.4. Hazardous decomposition products

- none

11. TOXICOLOGICAL INFORMATION

Toxicological data

Acute oral toxicity
- LD50, rat, > 4,000 mg/kg

Acute inhalation toxicity
- LC50, rat, > 4.74 mg/l

Acute dermal irritation/corrosion
- LD50, Remarks: no data available

Skin irritation
- rabbit, Mild skin irritation

Eye irritation
- rabbit, Mild eye irritation

Sensitisation
- no data available

Chronic toxicity
- no observed effect

Genetic toxicity in vitro
- Genotoxicity in vitro, Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

Teratogenicity
- Oral route (gavage), 10 days, Various species, 330 mg/kg, Did not show teratogenic effects in animal experiments.

Remarks
- Health injuries are not known or expected under normal use.

12. ECOLOGICAL INFORMATION

12.1. Ecotoxicity effects

Acute toxicity
- Fishes, Oncorhynchus mykiss, LC50, 96 h, 7,700 mg/l
- Fishes, Oncorhynchus mykiss, NOEC, 96 h, 2,300 mg/l
- Fishes, Lepomis macrochirus, LC50, 96 h, 7,100 mg/l
- Fishes, Lepomis macrochirus, NOEC, 96 h, 5,200 mg/l
- Crustaceans, Daphnia magna, EC50, 48 h, 4,100 mg/l
- Crustaceans, Daphnia magna, NOEC, 48 h, 3,100 mg/l

12.2. Mobility

- Water, Soil/sediments
  Remarks: Solubility
- Water, Soil/sediments
  Remarks: Mobility

12.3. Persistence and degradability

Abiotic degradation

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- Water, hydrolyses
  Result: acid/base equilibrium as a function of pH
  Degradation products: carbonic acid/bicarbonate/carbonate

Biodegradation

- Remarks: The methods for determining the biological degradability are not applicable to inorganic substances.

12.4. Bioaccumulative potential

- Result: not applicable

12.5. Other adverse effects

- no data available

12.6. Remarks

- Ecological injuries are not known or expected under normal use.

13. DISPOSAL CONSIDERATIONS

13.1. Waste from residues / unused products

- Contact waste disposal services.
- If recycling is not practicable, dispose of in compliance with local regulations.
- or
- Dilute with plenty of water.
- Neutralise with acid.
- In accordance with local and national regulations.

13.2. Packaging treatment

- To avoid treatments, as far as possible, use dedicated containers.
- or
- Clean container with water.
- Dispose of rinse water in accordance with local and national regulations.
- The empty and clean containers are to be reused in conformity with regulations.
- or
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.

14. TRANSPORT INFORMATION

- Sea (IMO/IMDG)
- not regulated
- Air (ICAO/IATA)
- not regulated
- U.S. Dept of Transportation
- not regulated
- It is recommended that ERG Guide number 111 be used for all non-regulated material.
- Canadian Transportation of Dangerous Goods
- not regulated

15. REGULATORY INFORMATION

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15.1. Inventory Information

Australian Inventory of Chemical Substances (AICS)	: -	In compliance with inventory.
Canadian Domestic Substances List (DSL)	: -	In compliance with inventory.
Korean Existing Chemicals List (ECL)	: -	In compliance with inventory.
EU list of existing chemical substances (EINECS)	: -	In compliance with inventory.
Japanese Existing and New Chemical Substances (MITI List) (ENCS)	: -	In compliance with inventory.
Inventory of Existing Chemical Substances (China) (IECS)	: -	In compliance with inventory.
Philippine Inventory of Chemicals and Chemical Substances (PICCS)	: -	In compliance with inventory.
Toxic Substance Control Act list (TSCA)	: -	In compliance with inventory.
New Zealand Inventory (in preparation) (NZ)	: -	All components on composite list considered for transfer.

15.2. Other regulations

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)

- not regulated.

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

- not regulated.

US. EPA CERCLA Hazardous Substances (40 CFR 302)

- not regulated.

US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

- not regulated.

US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

- not regulated.

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

- This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects..

15.3. Classification and labelling

Canada. Canadian Environmental Protection Act (CEPA). WHMIS Ingredient Disclosure List (Can. Gaz., Part II, Vol. 122, No. 2)

- Not listed

Remarks: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

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EC Label

- Not classified according to Directive 67/548/EEC.

16. OTHER INFORMATION

Ratings :

NFPA (National Fire Protection Association)
Health = 0 Flammability = 0 Instability = 0 Special =None

HMIS (Hazardous Material Information System)
Health = 0 Fire = 0 Reactivity = 0 PPE : Supplied by User; dependent on local conditions

Further information

- System maintenance
- Distribute new edition to clients

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of the company mentioned in section 1 in North America. If you are located in a country other than Canada, Mexico or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location. The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product). To our actual knowledge, the information contained herein is accurate as of the date of this document. However, neither the company mentioned in section 1 nor any of its affiliates makes any warranty, express or implied, including merchantability or fitness for use, or accepts any liability in connection with this information or its use. This information is for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right. The user alone must finally determine suitability of any information or material for any contemplated use in compliance with applicable law, the manner of use and whether any patents are infringed. This information gives typical properties only and is not to be used for specification purposes. The company mentioned in section 1 reserves the right to make additions, deletions or modifications to the information at any time without prior notification. Trademarks and/or other products of the company mentioned in section 1 referenced herein are either trademarks or registered trademarks of the company mentioned in section 1 or its affiliates, unless otherwise indicated.

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APPENDIX C

ENV-A 1400 COMPLIANCE DEMONSTRATION

AIR QUALITY DISPERSION MODELING REPORT
DRY SORBENT INJECTION
UNITS SR4 AND SR6

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
PORTSMOUTH, NEW HAMPSHIRE

PREPARED FOR:
Public Service Company of New Hampshire
Portsmouth, New Hampshire

PREPARED BY:
GZA GeoEnvironmental, Inc.
Manchester, New Hampshire

February 2014
File No. 04.0029995.00

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TABLE C-3	MODELING RESULTS SUMMARY
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APPENDICES

APPENDIX A	SUPPORTING CALCULATIONS AND DATA

1.0 INTRODUCTION

1.1 BACKGROUND

Public Service Company of New Hampshire (PSNH) Schiller Station (Schiller) is proposing to install Dry Sorbent Injection (DSI) and Activated Carbon Injection (ACI) systems on SR4 and SR6 for the purposes of complying with the emissions limitations established under 40 CFR Part 63, Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units. DSI/ACI systems are used to control a variety of air emissions such as sulfur dioxide (SO_2), hydrochloric acid (HCl) and mercury from the flue gas stream. PSNH is proposing to configure the DSI/ACI systems to be compatible with various sorbents including trona (trisodium hydrogendicarbonate dehydrate), sodium bicarbonate and activated carbon. Sorbents will be injected into the flue gas stream through strategically located ports upstream of the electrostatic precipitator (ESP). These sorbents are formulated to react with and/or adsorb constituents from the flue gas, the reaction products and sorbents are then removed downstream by the ESP.

Trona contains trace amounts crystalline silica as an impurity. Crystalline silica is a regulated toxic air pollutant (RTAP) under Env-A 1400, the New Hampshire Air Toxics Rule. Air quality dispersion modeling for RTAP emissions from the proposed DSI system was performed in order to evaluate compliance with the applicable Env-A 1400 RTAP Ambient Air Limits (AALs). This document constitutes the air pollution dispersion modeling report and contains the results of the analyses necessary to support the permit application for the proposed DSI/ACI systems. This report has been prepared by GZA GeoEnvironmental, Inc. (GZA) on behalf of PSNH in accordance with the *Guidance and Procedure for Performing Air Quality Impact Modeling in New Hampshire* (New Hampshire Department of Environmental Services [NHDES], July 2006).

1.2 SUMMARY OF FINDINGS

Based upon the results of the modeling analysis, RTAP emissions from the proposed DSI systems are not predicted to result in exceedances of the applicable Env-A 1400 AALs.

2.0 FACILITY AND SITE DESCRIPTION

Schiller is a wood and fossil fuel-fired electric generating station. SR4 and SR6 consist of two fossil fuel-fired electric utility steam generating units permitted to combust coal and oil, with biomass co-firing capacity of up to 10 percent (%) by weight of coal input. The facility also includes one wood and fossil fuel-fired boiler (SR5), a combustion turbine (SRCT), emergency generator, a primary and secondary coal crusher, coal and wood handling systems and various insignificant and exempt activities.

The facility is located at 400 Gosling Road in Portsmouth, New Hampshire. The Universal Transverse Mercator (UTM) coordinates for the facility are 354,770 meters easting and 4,772,950 meters northing.

3.0 EMISSIONS DATA

3.1 FACILITY EMISSIONS

RTAP emissions from the proposed DSI system at PSNH are presented in **Table C-1**. Emission rates were estimated based on the proposed maximum Trona injection rates, the Trona T-200 material safety data sheet, Trona T-100 particle size data for milled product, and previously established pollution control efficiencies for particulate matter for SR4 and SR6. Supporting documentation is provided in **Appendix A**. Modeled stack parameters are summarized in **Table C-2**.

4.0 GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS

Good engineering practice (GEP) stack height is the minimum stack height which would prevent the exhaust plume from becoming entrained in the turbulent wake created by nearby buildings or obstructions. For stack heights that are less than GEP, the plume may be affected by the wake region, resulting in higher ground level concentrations as the plume is more rapidly mixed to the ground. To model stacks that are less than GEP height, direction-specific building dimensions are included in the model input. These dimensions are then utilized to modify the dispersion parameters in the model to account for the building/obstruction wake effects. Stacks that are greater than GEP height will not be influenced by the wake region and, therefore, direction-specific building dimensions are not required by the model. The extent to which a stack exceeds both GEP height and 65 meters is treated as a prohibited dispersion technique and may not be accounted for in the ambient impact assessment.

A GEP stack height analysis was conducted for the PSNH facility point sources in accordance with the United States Environmental Protection Agency (USEPA) stack height regulations (40 CFR Part 51) and the USEPA revised *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)* (USEPA, 1985).

The Bowman Environmental Engineering GEP BPIP-Prime software was used to calculate the GEP stack height and the wind direction-specific building dimensions for each stack/wind direction combination as required for input into the AERMOD model. The program calculates the GEP stack height and appropriate building dimensions for 36 separate wind directions (i.e., every 10 degrees).

The results of the GEP analysis indicate a GEP stack height of approximately 97.11 meters for SR4 and 101.96 meters for SR6. The actual stack heights for SR4 and SR6 are less than GEP and, therefore, direction-specific building dimensions are required in the modeling to account for downwash. These dimensions, as calculated by the BPIP-PRIME program, have been transmitted separately, along with the associated AERMOD modeling files, to NHDES via email.

5.0 MODELING METHODOLOGY

The ambient impacts resulting from RTAP emissions from the proposed DSI system were assessed using the AERMOD model in accordance with the NHDES Modeling Guidance. The methodology used in each portion of this modeling analysis is described below.

5.1 MODELING ANALYSIS

5.1.1 Model Options

A refined modeling analysis for all terrain types was performed using the AERMOD model with five years of representative meteorological data. The modeling analysis used all of the regulatory default control options incorporated in the model. Direction-specific building dimensions from the BPIP-PRIME output were provided in the model input to account for building wake downwash.

5.1.2 Receptors

A Cartesian receptor grid was used with receptors spaced at 20-meter intervals along the fence line, 100-meter intervals out to 980 meters, and 1,000-meter intervals out to 17 kilometers. Terrain height elevations were calculated using AERMAP and U.S. Geologic Survey 7.5-minute digital elevation models (NAD27) for the model domain. The model domain was selected in accordance with the AERMAP Users Guide using the domain tool incorporated into BEEST for Windows, Version 10.10 from BEE-Line Software.

5.1.3 Meteorological Data

All AERMOD refined modeling was performed using five years of surface meteorological data (2008-2012) from Portsmouth, New Hampshire and upper air data (2008-2012) from Gray, Maine. This data was supplied by NHDES.

6.0 MODELING RESULTS

6.1 MAXIMUM IMPACTS

Maximum impacts for RTAP emissions were predicted by AERMOD, with the maximum pollutant impacts located near the southeastern property boundary for the annual averaging period and the western property boundary the 24-hour averaging period.

6.2 RESULTS SUMMARY

The model output summary is presented as **Table C-3**. A summary of the maximum impacts predicted by the model are presented in **Table C-4** along with a comparison to the applicable AALs. As shown in **Table C-4**, the maximum predicted impacts for the facility are well below the applicable Env-A 1400 AALs. The AERMOD modeling files associated with this evaluation have been transmitted separately to NHDES via email.

6.3 COMPLIANCE SUMMARY

Based on the information and assumptions presented in this report and the results of the modeling analysis, RTAP emissions from the proposed DSI system are not predicted to result in exceedances of the applicable Env-A 1400 AALs.

TABLES

TABLE C-1
CRYSTALLINE SILICA EMISSION RATES

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	CAS No.	Injection Sorbent	Precontrol Average 24-Hour Emission Rate (lb/hr/unit)[1]	Precontrol Average Annual Emission Rate (lb/hr/unit)[1]	Post Control Average 24-Hour Emissions (lb/hr/unit)[2]	Post Control 24-Hour Emissions (lb/day/unit)[2]	Post Control Average Annual Emissions (lb/hr/unit)[2]
Silica, Crystalline-quartz – respirable fraction	14808-60-7	Milled Trona	21.36	21.36	0.171	4.10	0.171

Notes:
1. Emission rates for silica (respirable fraction) were calculated using the following equations:

24-Hour Emission Rate = IR x S x RF / 24

Where:
IR - Injection Rate[3] (lb/hr)
S - Fraction of silica in trona[4]
RF - Respirable Fraction[4] (%)

Annual Emission Rate = IR x S x RF / 24 / 365

Where:
IR - Injection Rate[3] (lb/hr)
S - Fraction of silica in trona[4]
RF - Respirable Fraction[4] (%)

2. Post control emissions were based on 99.2% control efficiency for the SR4 and SR6 electrostatic precipitators.
3. Trona T-200 contains less than 0.4% silica (see MSDS).
4. A respirable fraction of 53.4% for milled Trona based on a respirable fraction cutoff of 10 microns using the particle size data provided in Appendix A.
5. The modeled emission rate was based on a maximum injection rate of 5 tons/hr or 10,000 pounds per hour for each unit as provided by PSNH.

TABLE C-2
STACK PARAMETERS

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Stack Information	UTM Coordinates		Base Elevation (ft)	Diameter (ft)	Height (ft)	Velocity (ft/s)	Temp (°F)	Orientation
	East (m)	North (m)						
SR4	354776.91	4772946.5	26	8.00	226.0	76.26	412	Vertical
SR6	354796.03	4772920.5	26	8.00	226.0	76.26	412	Vertical

TABLE C-3
MODELING RESULTS SUMMARY

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	24-HR	ALL	1ST	0.01291	355550	4772562	5.95	18.59	0	8071024	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	24-HR	ALL	1ST	0.01293	355539.9	4772545.8	10.37	18.29	0	9070524	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	24-HR	ALL	1ST	0.02277	354311.4	4772541.8	12.34	12.34	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	24-HR	ALL	1ST	0.01083	354200	4773700	0	0	0	11052624	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	24-HR	ALL	1ST	0.01606	362738.09	4787352.5	124.07	210.31	0	12091324	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	24-HR	SR4	1ST	0.00637	355550	4772562	5.95	18.59	0	8071024	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	24-HR	SR4	1ST	0.00643	355500	4773100	14.02	14.02	0	9071324	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	24-HR	SR4	1ST	0.01023	354200	4772500	12.6	12.6	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	24-HR	SR4	1ST	0.00552	354200	4773700	0	0	0	11052624	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	24-HR	SR4	1ST	0.00807	362738.09	4787352.5	124.07	210.31	0	12091324	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	24-HR	SR6	1ST	0.0072	354000	4773300	7.92	12.19	0	8112524	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	24-HR	SR6	1ST	0.00651	355539.9	4772545.8	10.37	18.29	0	9070524	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	24-HR	SR6	1ST	0.0134	354316.3	4772538.3	12.4	12.4	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	24-HR	SR6	1ST	0.00602	355700	4772500	10.67	13.11	0	11021924	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	24-HR	SR6	1ST	0.00842	354200	4772400	13.82	13.82	0	12102924	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	ANNUAL	ALL	1ST	0.00098	355800	4772900	5.99	5.99	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	ANNUAL	ALL	1ST	0.00099	355800	4772600	0	0	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	ANNUAL	ALL	1ST	0.00122	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	ANNUAL	ALL	1ST	0.00105	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	ANNUAL	ALL	1ST	0.00127	355600	4772700	0	0	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	ANNUAL	SR4	1ST	0.00049	355800	4773000	6.1	6.1	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	ANNUAL	SR4	1ST	0.00048	355700	4772900	7.86	7.86	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	ANNUAL	SR4	1ST	0.00058	355800	4772600	0	0	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	ANNUAL	SR4	1ST	0.00048	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	ANNUAL	SR4	1ST	0.00062	355600	4772800	2.61	11.89	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPOST.SUM	SILPOST	ANNUAL	SR6	1ST	0.00049	355800	4772900	5.99	5.99	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPOST.SUM	SILPOST	ANNUAL	SR6	1ST	0.00054	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPOST.SUM	SILPOST	ANNUAL	SR6	1ST	0.00066	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPOST.SUM	SILPOST	ANNUAL	SR6	1ST	0.00057	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPOST.SUM	SILPOST	ANNUAL	SR6	1ST	0.00065	355600	4772700	0	0	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	24-HR	ALL	1ST	1.61322	355550	4772562	5.95	18.59	0	8071024	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	24-HR	ALL	1ST	1.61482	355539.9	4772545.8	10.37	18.29	0	9070524	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	24-HR	ALL	1ST	2.8441	354311.4	4772541.8	12.34	12.34	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	24-HR	ALL	1ST	1.35231	354200	4773700	0	0	0	11052624	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	24-HR	ALL	1ST	2.00553	362738.09	4787352.5	124.07	210.31	0	12091324	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	24-HR	SR4	1ST	0.79605	355550	4772562	5.95	18.59	0	8071024	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	24-HR	SR4	1ST	0.80269	355500	4773100	14.02	14.02	0	9071324	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	24-HR	SR4	1ST	1.27757	354200	4772500	12.6	12.6	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	24-HR	SR4	1ST	0.68959	354200	4773700	0	0	0	11052624	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	24-HR	SR4	1ST	1.00854	362738.09	4787352.5	124.07	210.31	0	12091324	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	24-HR	SR6	1ST	0.89905	354000	4773300	7.92	12.19	0	8112524	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	24-HR	SR6	1ST	0.81348	355539.9	4772545.8	10.37	18.29	0	9070524	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	24-HR	SR6	1ST	1.67341	354316.3	4772538.3	12.4	12.4	0	10031424	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	24-HR	SR6	1ST	0.75162	355700	4772500	10.67	13.11	0	11021924	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	24-HR	SR6	1ST	1.0521	354200	4772400	13.82	13.82	0	12102924	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	ANNUAL	ALL	1ST	0.12294	355800	4772900	5.99	5.99	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	ANNUAL	ALL	1ST	0.12357	355800	4772600	0	0	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	ANNUAL	ALL	1ST	0.15185	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	ANNUAL	ALL	1ST	0.13134	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	ANNUAL	ALL	1ST	0.15859	355600	4772700	0	0	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	ANNUAL	SR4	1ST	0.0615	355800	4773000	6.1	6.1	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	ANNUAL	SR4	1ST	0.06046	355700	4772900	7.86	7.86	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	ANNUAL	SR4	1ST	0.07201	355800	4772600	0	0	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	ANNUAL	SR4	1ST	0.06009	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	ANNUAL	SR4	1ST	0.07765	355600	4772800	2.61	11.89	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2008_SILPRE.SUM	SILPRE	ANNUAL	SR6	1ST	0.06168	355800	4772900	5.99	5.99	0	1 YEARS	Portsmouth2008v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2009_SILPRE.SUM	SILPRE	ANNUAL	SR6	1ST	0.06792	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2009v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2010_SILPRE.SUM	SILPRE	ANNUAL	SR6	1ST	0.08223	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2010v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2011_SILPRE.SUM	SILPRE	ANNUAL	SR6	1ST	0.07126	355700	4772500	10.67	13.11	0	1 YEARS	Portsmouth2011v1.SFC	2	3	4729
AerMod 13350	Schiller DSI_2012_SILPRE.SUM	SILPRE	ANNUAL	SR6	1ST	0.08149	355600	4772700	0	0	0	1 YEARS	Portsmouth2012v1.SFC	2	3	4729

TABLE C-4
SUMMARY OF PREDICTED POLLUTANT IMPACTS

Public Service Company of New Hampshire
Schiller Station
Portsmouth, New Hampshire

Pollutant	CAS No.	Injection Sorbent	Pre Control		Post Control		24-Hour Ambient Air Limit ($\mu g/m^3$)	Annual Ambient Air Limit ($\mu g/m^3$)	PASS / FAIL	Percent of AAL (%)	
			24-Hour Impact ($\mu g/m^3$)	Annual Impact ($\mu g/m^3$)	24-Hour Impact ($\mu g/m^3$)	Annual Impact ($\mu g/m^3$)				24-Hour	Annual
SR4											
Silica, Crystalline-quartz – respirable fraction	14808-60-7	Milled Trona	1.28	0.078	0.0102	0.00062	0.089	0.06	PASS	11.49%	1.03%
SR6											
Silica, Crystalline-quartz – respirable fraction	14808-60-7	Milled Trona	1.67	0.082	0.0134	0.00066	0.089	0.06	PASS	15.06%	1.10%
Facility Total											
Silica, Crystalline-quartz – respirable fraction	14808-60-7	Milled Trona	2.84	0.159	0.023	0.0013	0.089	0.06	PASS	25.58%	2.12%

Notes:
1. Impacts are based on the emission rates presented in Table 1, which are based on the maximum trona injection rates provided by PSNH.
2. Both the pre control and post control emission rates were modeled as presented in Table 1, however only the post controls were compared to the 24-hr and annual AALs as control equipment will be operated during dry sorbent injection activities.

APPENDIX A

SUPPORTING CALCULATIONS AND DATA

STURTEVANT®
348 Circuit Street Hanover, MA 02339 www.sturtevantinc.com
Ph: 800-992-0209 781-829-6501 Fax: 781-829-6515

Particle Size Analysis Report

Instrument: MALVERN MASTERSIZER 2000

Machine Tested: Evergreen Power Trona Sample. ECP-1000 Lbs/Hr, Bag Catch

Measured: Friday, April 01, 2011 11:43:18 AM

Customer / Clyde Bergemann

Record No: 2

Particle Name: Trona

Sample bulk lot ref:

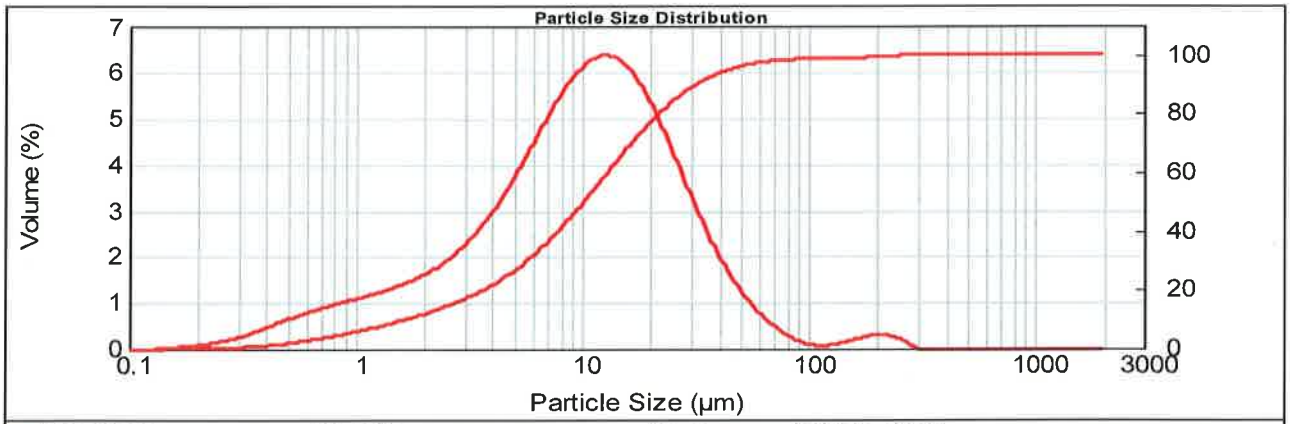
Measured by: B. MacNeil

Result Source: Measurement

Particle RI:	0.000	**Accessory Name:**	Scirocco 2000	**Obscuration:**	4.45 %
Absorption:	0	**Analysis model:**	General purpose	**Residual:**	2.857
Dispersant Name:	Dry dispersion	**Size range:**	0.020 to 2000.000 um	**Weighted Residual:**	0.150 %
Dispersant RI:	1.000	**Result Emulation:**	Off	**Result units:**	Volume

Concentration:	0.0006 %Vol	**Vol. Weighted Mean D[4,3]:**	15.808 um	**Specific Surface Area:**	1.61 m²/g
Span :	2.959	**Uniformity:**	1.1	**Surface Weighted Mean D[3,2]:**	3.729 um

d(0.1): 1.632 um **d(0.5): 10.091 um** **d(0.9): 31.490 um**



—Evergreen Power Trona Sample. ECP-1000 Lbs/Hr, Bag Catch, Friday, April 01, 2011 11:43:18 AM

Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.182	0.06	3.311	18.58	60.256	97.54	1096.478	100.00
0.011	0.00	0.209	0.13	3.802	20.98	69.183	98.11	1258.925	100.00
0.013	0.00	0.240	0.24	4.365	23.73	79.433	98.47	1445.440	100.00
0.015	0.00	0.275	0.40	5.012	26.89	91.201	98.67	1659.587	100.00
0.017	0.00	0.316	0.62	5.754	30.52	104.713	98.77	1905.461	100.00
0.020	0.00	0.363	0.91	6.607	34.62	120.226	98.84	2187.762	100.00
0.023	0.00	0.417	1.31	7.586	39.21	138.038	98.92	2511.886	100.00
0.026	0.00	0.479	1.82	8.710	44.24	158.489	99.07	2884.032	100.00
0.030	0.00	0.550	2.42	10.000	49.63	181.970	99.29	3311.311	100.00
0.035	0.00	0.631	3.12	11.482	55.28	208.930	99.56	3801.894	100.00
0.040	0.00	0.724	3.90	13.183	61.04	239.883	99.81	4365.158	100.00
0.046	0.00	0.832	4.76	15.136	66.74	275.423	99.99	5011.872	100.00
0.052	0.00	0.955	5.69	17.378	72.22	316.228	100.00	5754.399	100.00
0.060	0.00	1.096	6.69	19.953	77.31	363.078	100.00	6606.934	100.00
0.069	0.00	1.259	7.76	22.909	81.87	416.869	100.00	7585.776	100.00
0.079	0.00	1.445	8.91	26.303	85.82	478.630	100.00	8709.636	100.00
0.091	0.00	1.660	10.16	30.200	89.13	549.541	100.00	10000.000	100.00
0.105	0.00	1.905	11.51	34.674	91.80	630.957	100.00		
0.120	0.00	2.188	12.99	39.811	93.90	724.436	100.00		
0.138	0.00	2.512	14.64	45.709	95.50	831.764	100.00		
0.158	0.02	2.884	16.49	52.481	96.69	954.993	100.00		

The above data is to indicate the effectiveness of Sturtevant equipment. Due to the differences in particle size analysis technology, it is recommended that this data be confirmed using your specific method of analysis.

Operator Notes: 2 Bar pressure.

STURTEVANT®
348 Circuit Street Hanover, MA 02339 www.sturtevantinc.com
Ph: 800-992-0209 781-829-6501 Fax: 781-829-6515

Particle Size Analysis Report

Instrument: MALVERN MASTERSIZER 2000

Machine Tested: Evergreen Power Trona Sample. ECP-3000 Lbs/Hr, Bag Catch

Measured: Friday, April 01, 2011 11:47:02 AM

Customer / Clyde Bergemann

Record No: 3

Particle Name: Trona

Sample bulk lot ref:

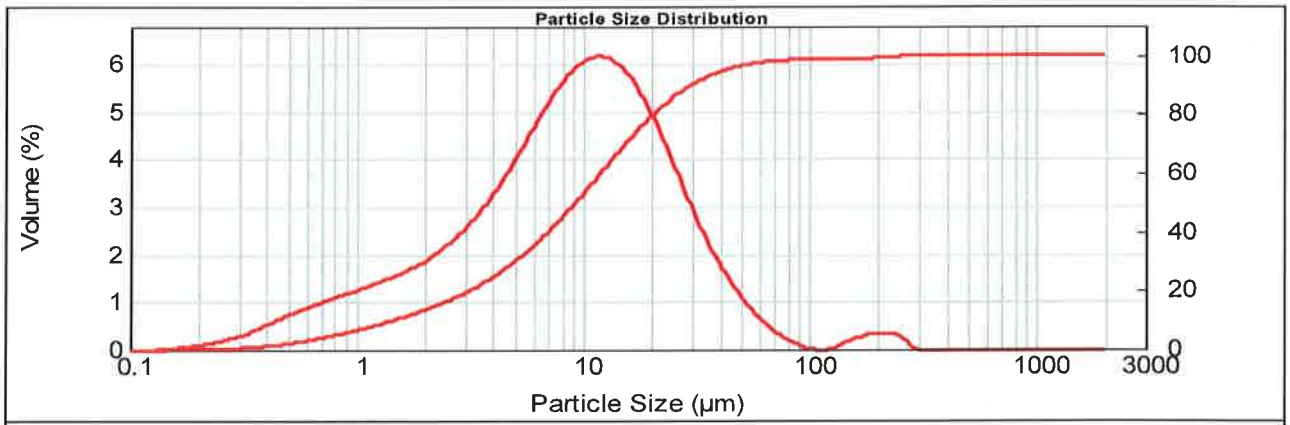
Measured by: B. MacNeil

Result Source: Measurement

Particle RI:	0.000	**Accessory Name:**	Scirocco 2000	**Obscuration:**	4.25 %
Absorption:	0	**Analysis model:**	General purpose	**Residual:**	3.919
Dispersant Name:	Dry dispersion	**Size range:**	0.020 to 2000.000 um	**Weighted Residual:**	0.179 %
Dispersant RI:	1.000	**Result Emulation:**	Off	**Result units:**	Volume

Concentration:	0.0005 %Vol	**Vol. Weighted Mean D[4,3]:**	14.904 um	**Specific Surface Area:**	1.76 m²/g
Span :	3.068	**Uniformity:**	1.16	**Surface Weighted Mean D[3,2]:**	3.409 um

d(0.1): 1.431 um **d(0.5): 9.170 um** **d(0.9): 29.570 um**



Evergreen Power Trona Sample. ECP-3000 Lbs/Hr, Bag Catch, Friday, April 01, 2011 11:47:02 AM

Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.182	0.06	3.311	21.12	60.256	97.86	1096.478	100.00
0.011	0.00	0.209	0.14	3.802	23.76	69.183	98.32	1258.925	100.00
0.013	0.00	0.240	0.27	4.365	26.76	79.433	98.59	1445.440	100.00
0.015	0.00	0.275	0.44	5.012	30.15	91.201	98.73	1659.587	100.00
0.017	0.00	0.316	0.68	5.754	33.98	104.713	98.75	1905.461	100.00
0.020	0.00	0.363	1.01	6.607	38.25	120.226	98.75	2187.762	100.00
0.023	0.00	0.417	1.45	7.586	42.95	138.038	98.78	2511.886	100.00
0.026	0.00	0.479	2.02	8.710	48.03	158.489	98.95	2884.032	100.00
0.030	0.00	0.550	2.70	10.000	53.39	181.970	99.19	3311.311	100.00
0.035	0.00	0.631	3.48	11.482	58.91	208.930	99.49	3801.894	100.00
0.040	0.00	0.724	4.36	13.183	64.46	239.883	99.79	4365.158	100.00
0.046	0.00	0.832	5.33	15.136	69.87	275.423	99.99	5011.872	100.00
0.052	0.00	0.955	6.39	17.378	75.00	316.228	100.00	5754.399	100.00
0.060	0.00	1.096	7.54	19.953	79.70	363.078	100.00	6606.934	100.00
0.069	0.00	1.259	8.77	22.909	83.87	416.869	100.00	7585.776	100.00
0.079	0.00	1.445	10.10	26.303	87.44	478.630	100.00	8709.636	100.00
0.091	0.00	1.660	11.53	30.200	90.41	549.541	100.00	10000.000	100.00
0.105	0.00	1.905	13.09	34.674	92.80	630.957	100.00		
0.120	0.00	2.188	14.80	39.811	94.67	724.436	100.00		
0.138	0.00	2.512	16.68	45.709	96.09	831.764	100.00		
0.158	0.02	2.884	18.77	52.481	97.13	954.993	100.00		

The above data is to indicate the effectiveness of Sturtevant equipment. Due to the differences in particle size analysis technology, it is recommended that this data be confirmed using your specific method of analysis.

Operator Notes: 2 Bar pressure.

T-200®

Trona: T-200®

Material Safety Data Sheet

Chemical: Sodium Sesquicarbonate

NFPA: H=1 F=0 I=0 S= None
HMIS: H=1 F=0 R=0 PPE= Supplied by user; dependent on conditions

MSDS Number: Trona-1103
Effective Date: 11 November 2003
Issued by: Solvay Chemicals, Inc. Regulatory Affairs Department

Not valid three years after effective date or after issuance of superseding MSDS, whichever is earlier. French or Spanish translations of this MSDS may be available. Check www.solvaychemicals.us or call Solvay Chemicals, Inc. to verify the latest version or translation availability.

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of Solvay Chemicals, Inc. in North America. If you are located in a country other than Canada , Mexico, or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location.

1. Company and Product Identification

1.1 Product Name: T-200®
Chemical Name: Sodium sesquicarbonate
Synonyms: Mechanically refined trona.
Chemical Formula: $Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$
Molecular Weight: 226
CAS Number: 533-96-0
EINECS Number: 208-580-9
Grades/Trade Names: T-200®

1.2 Recommended Uses: Consult supplier

1.3 Supplier: Solvay Chemicals, Inc.
PO BOX 27328 Houston, TX 77227-7328
3333 Richmond Ave. Houston, Texas 77098

1.4 Emergency Telephone Numbers
Emergencies (USA): 1-800-424-9300 (CHEMTREC®)
Transportation Emergencies (INTERNATIONAL/MARITIME): 1-703-527-3887 (CHEMTREC®)
Transportation Emergencies (CANADA): 1-613-996-6666 (CANUTEC)
Transportation Emergencies (MEXICO-SETIQ): 01-800-00-214-00 (MEX. REPUBLIC)
525-559-1588 (Mexico City and metro area))

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Solvay Chemicals

SOLVAY

Interox, Fluorides & Minerals

2. Composition/Information on Ingredients

INGREDIENTS	FORMULA	WT. PERCENT	CAS #	EINECS #
Sodium sesquicarbonate	$Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$	98	533-96-0	208-580-9
Silica, crystalline quartz	SiO_2	<0.4	14808-60-7	238-878-4
H_2O insolubles	Not Applicable	2	Not Applicable	Not Applicable

3. Hazards Identification

Emergency Overview: Product reacts with acids to produce carbon dioxide and heat.

3.1 Route of Entry: Inhalation: Yes Skin: Yes Ingestion: Yes

3.2 Potential Effects of exposure: Sodium Sesquicarbonate is an alkaline product and may irritate digestive mucous membranes, eyes and healthy skin.

Inhalation: May be irritating to the nose, throat, and respiratory tract. Repeated exposure may cause nosebleeds.

Eyes: May cause irritation, severe watering and redness.

Skin contact: May cause skin irritation, seen as redness and swelling. In the presence of moisture or sweat, irritation may become more severe leading to rash.

Ingestion: May cause gastrointestinal irritation including nausea, vomiting, abdominal cramps and diarrhea. May cause irritation of the mouth and throat.

Carcinogenicity: See section 11.3

4. First-Aid Measures

General Recommendations: Treat for eye, skin and respiratory tract irritation.

4.1 Inhalation: Remove subject to a dust free environment and blow nose. If breathing is difficult or has stopped, administer artificial respiration. If any irritation is present, seek medical attention.

Eyes: In cases of splashing of concentrated solution in the eyes and face, treat the eyes first, and then continue first aid as defined under "contact with the skin." Rinse the eyes with running water for 15 minutes, maintaining the eyelids wide open to eliminate the product. Protect the eyes from strong light. Consult a physician or ophthalmologist in all cases.

Skin:

- Remove contaminated shoes, socks and clothing, under a shower if necessary; wash the affected skin with luke warm water.
- Keep warm (blanket), provide clean clothes.
- Consult with a physician in all cases.
- Dry carefully.
- In case of persistant pain or reddening, consult physician.

Ingestion: Do not induce vomiting. Remove any evidence of the product from the person's mouth.

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If the subject is completely conscious: Give 8-12 ounces of water. SEEK MEDICAL ATTENTION.

If the subject is unconscious:
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSIOUS PERSON.

5. Fire-Fighting Measures

5.1 **Flash point:** Non combustible.

5.2 **Auto-ignition Temperature**: Not Applicable.

5.3 **Flammability Limits:** Not Applicable.

5.4 **Unusual Fire and Explosion Hazards:** Non-combustible and non-explosive.

5.5 **Common Extinguishing Methods:** In case of fire near stored product, all means of extinguishing are acceptable.

6. Accidental Release Measures

6.1 **Precautions:** Avoid excessive dust.

6.2 **Cleanup methods:** Clean up uncontaminated material and recycle into process. Place unusable material into a closed, labeled container compatible with the product.

6.3 **Precautions for protection of the environment:** Sweep up residual material. Do not flush to drain. Prevent material from entering public sewer systems or any waterways. Dispose of waste in accordance with applicable federal, state, and local environmental laws and regulations.

7. Handling and Storage

7.1 **Handling:**
- Avoid prolonged or repeated contact with the skin or eyes.
- Do not wear contact lenses without proper eye protection when using this product.
- Avoid prolonged or repeated breathing of dusts.
- Use vacuum or wet mop to clean up dust.

7.2 **Storage:** Keep in a closed, properly labeled container in a dry area away from acids. Protect from physical damage.

7.3 **Specific Uses:** See Section 1.2

7.4 **Packaging:**
- Bulk rail car and truck
- Paper+PE
- Woven plastic material + PE coating
- Woven plastic material + PE.

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8. Exposure Controls/Personal Protection

8.1 Exposure Limit Values	TLV® ACGIH®-USA (2002)	OSHA PEL
Sodium Sesquicarbonate		Nuisance Dust-5 mg/m³ (Respirable Fraction), 15 mg/m³ (Total Dust).
Silica, Crystalline Quartz	0.05 mg/m³ for 8 hourTWA	10 mg/m³ / % Silica + 2

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.

8.2 Exposure Controls:

8.2.1 Occupational Exposure Controls:

8.2.1.1 Ventilation: In places with the possibility for creating excessive dust in excess of exposure limits, ventilation should be provided.

8.2.1.2 Respiratory protection: In case of significant or accidental dust emissions, a NIOSH/MSHA approved dust respirator should be worn.

8.2.1.3 Hand protection: Cotton gloves are adequate for routine handling of dry product.

8.2.1.4 Eye protection: In cases of significant dust, dust proof goggles are recommended.

8.3 Other precautions: Protective clothing in dusty areas. An eyewash and safety shower should be nearby and ready for use. Use good hygiene practices when handling this product including changing work clothes after use. Do not eat, drink or smoke in areas where this material is handled.

9. Physical and Chemical Properties

9.1 Appearance: Powder

Color: White to off white

Odor: Odorless

9.2 Important Health, Safety and Environmental information:
pH: 10.1 (1-% solution).

Change of state:
Melting point: Decomposes at >70°C (158°F).
Boiling point: Not applicable.
Decompositon Temperature: Beginning at 70°C (158°F).

Flash Point: Not Applicable

Flammability: Not Applicable
(solid, gas)

Explosive Properties: Not Applicable

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Oxidizing Properties: Not Applicable
Vapor Pressure: Not Applicable

Relative Density: Specific gravity (H_2O=1): 2.11

Solubility:
Water: 20% maximum by weight in water @ 30°C (86°F).
Fat: Not Applicable.

Partition coefficient: P (n-octanol/water): Not applicable.

Viscosity: Not listed

Vapor Density (air=1): Not Applicable.

Evaporation Rate: Not Applicable.

9.3 Other Information:

Bulk Density: 49 lbs./ft^3 (780 kg/m^3)

10. Stability and Reactivity

Stability: Stable at ambient temperature and atmospheric pressure.

10.1 Conditions to avoid:
- Protect from moisture
- Mixing of acid, oxidizing agents and sodium sesquicarbonate solutions could cause CO_2 evolution and may cause severe splattering.

10.2 Materials and substances to avoid: Sodium sesquicarbonate mixed with lime dust in the presence of moisture will form caustic soda, which can cause serious burns. When heated, may react with Aluminum (Al). Reacts with acids and releases large volumes of CO_2 gas and heat.

10.3 Hazardous decomposition products: Carbon dioxide (CO_2) is evolved when mixed with acids and oxidizing agents.

10.4 Hazardous Polymerization: None.

10.5 Other information: None.

11. Toxicological Information

11.1 Acute toxicity:
Inhalation: LC_{50} 2300 mg/m^3/2h(sodium carbonate) species: rat.
Oral: LD_{50} 4090 mg/kg (sodium carbonate) species: rat.

Dermal: LD_{50}, rabbit, >2,000 mg/kg (sodium carbonate)

11.2/11.3 Chronic toxicity/ Carcinogenic Designation: This product contains less than 0.4% Silica, crystalline quartz. Silica, crystalline quartz at greater than 1% has been shown to cause silicosis, a progressive lung disease. Silica is a suspected carcinogen.

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12. Ecological Information

12.1 Acute ecotoxicity:
SODIUM BICARBONATE: **Crustaceans**, Daphnia magna, LC_{50}, 48 hours, 2350 mg/l.
Fishes, Gambusia affinis, LC_{50}, 96 hours, 7550 mg/l.

SODIUM CARBONATE: **Crustaceans**, Daphnia sp., LC_{50}, 48 hours, from 115 to 150 mg/l.
Fishes, various species, LC_{50}, 96 hours, from 30 to 1,200 mg/l.

12.2 Chronic ecotoxicity: None listed.

12.3 Mobility: Water-Considerable solubility and motility.

12.4 Degradation
Abiotic:
- Water, hydrolysis. Degradations products: Carbonate (pH.10/bicarbonate (pH 6-10)/carbonic acid/carbon dioxide (pH<6)
- Soil-Result: Hydrolysis as a function of pH.

Biotic: Not Applicable.

12.5 Potential for bioaccumulation: Not Applicable.

12.6 Other adverse effects /Comments: Observed effects are related to alkaline properties of product. Product is not significantly hazardous for the environment.

13. Disposal Considerations

13.1 Waste treatment: T-200 is not a listed hazardous waste under 40 CFR 261. However, state and local regulations for waste disposal may be more restrictive. Spilled product should be disposed of in an EPA approved disposal facility in accordance with applicable national, state and local environmental laws and regulations.

13.2 Packaging treatment: To avoid treatments, use dedicated containers where possible. Rinse the empty containers and treat the effluent in the same way as waste. Consult current federal, state and local regulations regarding the proper disposal of emptied containers.

13.3 RCRA Hazardous Waste: Not Listed.

14. Transport Information

Mode	DOT	IMDG	IATA
UN Number	Not a regulated hazardous material	Not a regulated hazardous material	Not a regulated hazardous material
Other	It is recommended that ERG guide # 111 be used for all non DOT regulated material.		
STCC #:	28-123-87		

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15. Regulatory Information

National Regulations (US)

TSCA Inventory 8(b): Yes

SARA Title III Sec. 302/303 Extremely Hazardous Substances (40 CFR355): No

SARA Title III Sec. 311/312 (40 CFR 370:

Hazard Category:
- Acute and Chronic health hazard
- Threshold planning quantity - 10,000 lbs

SARA Title III Sec. 313 Toxic Chemical Emissions Reporting (40 CFR 372): No

CERCLA Hazardous Substance (40CFR Part 302)

Listed: No
Unlisted Substance: No

State Component Listing: None identified

National Regulations (Canada)

Canadian DSL Registration: Yes

WHMIS Classification: Not Applicable

This product has been classified in accordance with the hazard criteria of the ***Controlled Products Regulations*** and the MSDS contains all the information required by the ***Controlled Products Regulations.***

Labeling according to Directive 1999/45/EC.

Name of dangerous products-sodium sesquicarbonate

Symbols	**Xi**	**Irritant**
Phrases R	36	Irritating to eyes

16. Other Information

16.1 Ratings:

NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

Health = 1 Fire = 0 Instability = 0 Special = none

HMIS (HAZARDOUS MATERIAL INFORMATION SYSTEM)

Health = 1 Fire = 0 Reactivity = 0 PPE = Supplied by User; dependent on local conditions

16.2 Other Information:

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

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16.3 Reason for revision:
Supersedes edition: Solvay Minerals MSDS #015 dated 4/9/03.
Purpose of revision: Change Company name and MSDS format.

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APPENDIX D

PROOF OF GOOD STANDING

NEW HAMPSHIRE

Corporation Division

Search
By Business Name
By Business ID
By Registered Agent
Annual Report
File Online
Guidelines
Name Availability
Name Appeal Process

Date: 2/12/2014

Filed Documents

(Annual Report History, View Images, etc.)

For a blank Annual Registration Report, click here.

Business Name History

Name	Name Type
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE	Legal

Corporation - Domestic - Information

Business ID:	18692
Status:	Good Standing
Entity Creation Date:	8/16/1926
Principal Office Address:	780 N Commercial Street Manchester NH 03101
Principal Mailing Address:	Kay Comendul Northeast Utilities Service Company PO Box 270 Hartford CT 06141
Last Annual Report Filed Date:	3/14/2013
Last Annual Report Filed:	2013

Registered Agent

Agent Name:	C T Corporation System
Office Address:	9 Capitol Street Concord NH 03301
Mailing Address:	

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