PROJECT DESCRIPTION

Pursuant to RSA 125-C:10-e, the New Hampshire Department of Environmental Services (NHDES) determined that devices operated at Saint-Gobain Performance Plastics Corporation (SGPP), 701 Daniel Webster Highway in Merrimack, New Hampshire have emitted and continue to emit to the air perfluorinated compounds (PFCs)[1] and precursors. The emission of these PFCs have caused and continue to contribute to an exceedance of ambient groundwater quality standards (AGQS) as a result of deposition of the PFCs and precursors from the air. Therefore, the devices located at SGPP are subject to the application of best available control technology (BACT) as defined in RSA 125-C:10-b, I(a).

- SGPP was required to submit an air permit application and BACT analysis to NHDES by March 26, 2019. The details of NHDES' determination and the requirements of the application were outlined in the NHDES letter issued to SGPP on September 26, 2018.
- SGPP submitted both a confidential and a redacted air permit application on March 26, 2019 with supplemental information on April 19, 2019.
- NHDES requested additional information in a letter dated May 1, 2019.
- SGPP submitted supplemental information in a letter with attachments on May 30, 2019.
- NHDES sent a letter to SGPP on June 20, 2019 regarding EPA Office of Research and Development (EPA ORD) Report #6 which identified additional per- and polyfluorinated alkyl substances (PFAS) emitted from the facility. In the letter, NHDES quantified 89 PFAS compounds and identified the need for air dispersion modeling for hydrogen fluoride (HF) emissions from the proposed control device.
- SGPP submitted additional information in a letter dated August 1, 2019. In the letter, SGPP responded to the NHDES letter dated June 20, 2019 regarding the calculation methodology for PFAS and HF emissions and submitted an air dispersion model conducted by Barr Engineering Co. (Barr) for HF (as fluoride) emissions from the proposed control device.
- On July 31, 2019, NHDES requested additional information regarding small devices not previously included in historical air permits due to the nature of their operation. SGPP submitted the requested information along with changes to the maximum production rates of the coating towers and heat inputs of the combustion devices associated with the coating towers on August 20, 2019 and revised calculations as a result on August 29, 2019.
- The facility has determined that a Regenerative Thermal Oxidizer (RTO) would satisfy the requirements of the BACT analysis and is requesting via this application that NHDES issue a Temporary Permit pursuant to Env-A 607, *Temporary Permits* for the installation of a RTO for the control of PFC and precursor emissions associated with the facility's coating operations.
- This permit application review summary outlines NHDES' review of the temporary permit application, BACT analysis and regulatory requirements associated with the SGPP facility.
- The current State Permit to Operate (SP-0072) is scheduled to expire on April 30, 2020. Therefore, a renewal application package including all the information contained in this permit application and additional information related to the antenna cover fabrication area, emergency generator, and fire pump engine is due January 31, 2020. These devices (EU17, EU20 and EU21) were already a significant part of the regulatory review as a component

[1] RSA 125-C:10-e uses the term "Perfluorinated compounds" or PFCs. RSA 125-C:10-e I(d) defines PFCs as a list of compounds identified in paragraph 1.1 of Environmental Protection Agency Document #: EPA/600/R-08/092 Method 537. "Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)", Version 1.1 (September 2009). The term PFAS (per- and polyfluorinated substances) and PFCs are used interchangeably in this document; most notably using PFCs when referring to the statute requirements and PFAS when referring to overall compounds of interest.

of the temporary permit application. Therefore, on September 30, 2019, SGPP submitted additional information related to these devices and requested that the supplemental information be incorporated into this application package to satisfy the renewal application requirements for SP-0072. Therefore, this permit includes existing conditions from SP-0072 that did not change as a result of this project and upon issuance of this temporary permit, SP-0072 is terminated.

FACILITY DESCRIPTION

SGPP primarily manufactures polytetrafluoroethylene (PTFE) coated fabrics and PTFE films. The fabrics are manufactured for a variety of chemical and weather resistant applications. SGPP is currently permitted to operate 14 coating towers[2], an antenna cover fabrication area, a fire pump, and an emergency generator, all covered under an existing State Permit to Operate, SP-0072 which expires April 30, 2020. There are additional ancillary devices at the facility that do not emit air pollutants above permitting thresholds and are therefore not covered by the current air permit[3].

In the PTFE coating towers, the fabric is passed through a coater dip pan filled with a PTFE aqueous dispersion, which can include surfactants, viscosity modifiers and colorants. The fabric then passes through a heating tower, which is divided into three temperature zones that remove water, volatilize the surfactant and sinter the resin onto the fabric. Similarly, the production of film products includes the same sequence of steps, however, rather than coating a cloth, the PTFE coating is temporarily applied to a reusable carrier belt. The film coating is then removed and the carrier belts are reused. The fabric and/or film can go through a single or multiple pass process to produce the desired intermediate or final product. SGPP manufactures finished products in which the intermediate coated fabrics and films are laminated and/or cut and assembled into final products.

In addition to the primary coating towers, there are other smaller production activities. The Chemsil process applies and dries coating onto fabric by thermally treating a solid paste without the use of a carrier solvent. There are also several pieces of post-processing equipment utilized at the facility after materials have been run on the coating towers. The MTM and Step Press/Laminator are pieces of equipment that utilize heat to perform operations which laminate or otherwise affix coated fabric and films. Neither piece of equipment utilizes the addition of solvents or other chemicals to join the different types of materials. The Heat Clean source is an oven used for cleaning by heating, and similarly does not involve the addition of solvents or other chemicals. These pieces of equipment have not previously appeared in the facility's air permit because they are not expected to result in releases of volatile organic solvents (VOCs), regulated toxic air pollutants (RTAPs) or hazardous air pollutants (HAPs). However, each of these sources are proposed to be exhausted to the new RTO control device in order to maximize the potential collection and control of PFC by minimizing the potential for fugitive releases from facility operations. Therefore, they are being added as emission units in the proposed draft permit.

SGPP is currently permitted for an antenna cover fabrication area as part of the finishing operations. This operation includes manual application of adhesives to the fabric for bonding to other pieces of fabric, ancillary items or to metal frames. This process emits VOCs, RTAPs and HAPs but not PFCs.

SGPP is permitted for operation of an emergency generator and a fire pump engine. A #2 fuel oil-fired boiler system (for building heat) rated at 1.56 MMBtu/hr is also located at the facility but is below permitting thresholds. Because the proposed RTO will combust natural gas and therefore produces criteria pollutants[4], facility-wide emission calculations of criteria pollutants from all fuel burning equipment were included in the application and evaluated in this permit application review summary. SGPP has the potential to emit VOCs at levels greater than the major source threshold of 50 tpy and the potential to emit HAPs at levels greater than the major source threshold of 10 tpy for any individual HAP and 25 tpy for all HAPs combined. Therefore, the facility has permit conditions limiting these pollutants to less than these thresholds thereby establishing the facility as a synthetic

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2 Use of the ME Tower (EU11) was discontinued in November 2016 and the unit was removed in October 2017. Use of the MI Tower (EU14) was discontinued in March 2017 and the unit was removed in October 2017.

3 See *REVIEW OF REGULATIONS: State Regulations* later in the permit application review summary for permit applicability requirements.

4 Criteria pollutants include particulate matter (PM_{10}), sulfur dioxide (SO_2), oxides of nitrogen (NOx), and carbon monoxide (CO). In addition, volatile organic compounds (VOCs) are included because in combination with NOx, these compounds react in the atmosphere to from ozone which is another criteria pollutant for which EPA has set National Ambient Air Quality Standards (NAAQS).

minor source of air pollution for VOCs and HAPs. The Facility does not have the potential to emit the criteria pollutants SO_2, NOx, CO, and PM_{10} at levels greater than the major source thresholds for these pollutants. Therefore, the facility is a true minor source for SO_2, NOx, CO, and PM_{10}.

PERMIT HISTORY

Table 1 - Permit History

Permit #	Application #	Description	Issue Date	Expiration Date
TP-BP-358	FY90-0084	Initial Temporary Permit – Pressure Sensitive Adhesive Coater[5]	01/04/1991	06/30/1992
PO-BP-2607	FY90-0084	Initial State Permit to Operate – PSA Coater	06/11/1992	06/30/1995
TP-BP-0461	FY93-0148	Initial Temporary Permit – Antenna Cover Fabrication Area[6]	10/15/1993	04/30/1995
PO-BP-2607	FY94-0158	Permit Amendment regarding emission estimates for VOCs and silica (RTAP) – PSA Coater	03/25/1994	06/30/1995
PO-BP-2607 PO-BP-2697	No application # assigned (received 09/07/1995)	Permit Renewal – PSA Coater & Initial State Permit to Operate – Antenna Cover Fabrication Area	02/06/1996	02/28/2001
PO-BP-2607 PO-BP-2697	N/A	Administrative Amendment – Change in ownership from Chemfab Corporation to Compagnie de Saint-Gobain. Name change to Chemfab/Saint-Gobain Performance Plastics.	N/A	02/28/2001
FP-S-0151	FY01-0074	SGPP requested permit PO-BP-2607 be re-issued until 08/31/2001. Requested renewal of State Permit to Operate for Antenna Cover Fabrication Area.	05/29/2001	05/31/2006
FP-T-0075	FY02-0035	Initial Temporary Permit – Tower Coaters SGPP submitted an application for installation of 9 towers being moved from VT to NH in addition to the existing 9 towers and R&D tower in NH.	12/04/2001	06/30/2003
FP-S-0151	FY03-0189	Permit FP-S-0151 Renewal for the Antenna Cover Fabrication Area & incorporation of FP-T-0075 requirements for the Tower Coaters into one facility-wide permit	11/14/2003	11/30/2008
SP-0072	08-0335	Permit Renewal – Facility-wide permit	12/17/2009	12/31/2014
SP-0072	10-0161	Minor Amendment to replace 27 natural gas burners on tower coaters with new high-efficiency burners.	N/A	12/31/2014
SP-0072	14-0379	Permit Renewal – Facility-wide permit	04/21/2015	04/30/2020
SP-0072	15-0492	Minor Amendment to replace 2 old fire pumps.	10/16/2015	04/30/2020

[5] The Pressure Sensitive Adhesive (PSA) Coater was installed in 1990 and removed from service August 31, 2001. The device applied VOC containing adhesive materials to the PTFE coated fiberglass fabrics for final assembly. Based on the information reviewed, it does not appear that PFAS compounds were utilized on this device.

[6] Based on the information reviewed, it does not appear that PFAS compounds were utilized on this device.

PROCESS/DEVICE DESCRIPTION

Table 2 – Emission Unit Identification

Process Identification		Process Parameters					Combustion Parameters (if applicable)			
Emission Unit ID[7]	**Device Name**	**Installation Date**	**Tower Width (in)**	**Max Product Width (in)**	**# of Stages**	**Maximum Production (sq. ft/hr)[8]**	**Number of Heating Zones**	**Temperature Range per Zone (°F)**	**Fuel Type**	**Maximum Heat Input (MMBtu/hr)**
EU01	MA Tower	1994	76	60	1	6,000	3	150 - 750	Natural Gas	3.9
EU02	MB Tower	1998	188	175	1	17,500	3	150 - 750	NG/Electric	7.5
EU03	MC Tower	1998	96	92	1	9,200	3	150 - 750	NG/Electric	4.5
EU04	MR Tower	2002	96	92	1	9,200	3	150 - 750	NG/Electric	4.5
EU05	MD Tower	1999	96	92	2	9,200	3	150 - 750	NG/Electric	9.0
EU06	QX Tower	1989	72	60	5	6,000	15	150 - 750	NG/Electric	7.5
EU07	20" SBC	1986	20	20	6	500	18	200 - 750	Electric	N/A
EU08	20" Coater	1986	20	20	1	500	2	150 - 450	Electric	N/A
EU12	MG Tower	2002	198	175	1	4,375	3	150 - 750	Natural Gas	6.0
EU13	MP Tower	2002	188	175	1	4,375	3	150 - 750	Natural Gas	7.5
EU15	MQ Tower	2002	48	44	1	1,100	3	150 - 750	Natural Gas	4.5
EU16	MS Tower	2002	96	92	1	2,300	3	150 - 750	NG/Electric	4.5
EU17	Antenna Cover Fabrication Area	1993	N/A	N/A	N/A	N/A	None	N/A	None	N/A
EU22	R & D Coater	N/A	34	26	1	2,600	3	150 - 750	Natural Gas	2.0
EU23	Chemsil Coater	N/A	42	38	1	3,800	6	150 - 600	Electric	N/A
EU24	MTM	N/A	52	50	1	5,000	2	150 - 750	Natural Gas	3.0
EU25	Step Press/Laminator	N/A	60	48	1	4,800	1	650	Electric	N/A
EU26	Heat Clean	N/A	5'x6'x 19'	N/A	1	N/A	1	150 - 750	Natural Gas	1.5

[7] Use of MH Tower (EU09) was discontinued prior to 2010 and the unit was removed in April 2013. Use of MX Tower (EU10) was discontinued in 2010 and the unit was removed in May 2012.

[8] SGPP submitted revised maximum production rates for the towers in an email dated August 20, 2019. Since maximum production rates was factored into the emission estimates both for calculating RTAPs (Attachment B.7 of the application) and scaling factors (Attachment B.8 of the application), C.T. Male recalculated the emissions affected by these changes and submitted revised numbers on August 29, 2019. NHDES reviewed the revisions submitted and concurred with C.T. Male that the changes did not result in additional regulatory requirements or changed the facility's status with respect to regulatory compliance with existing permit limits.

In addition to the process equipment listed in Table 2, SGPP also operates the following fuel burning devices that meet the permitting applicability:

Table 3 – Summary of Additional Fuel Burning Equipment Rated Above Permitting Thresholds

Emission Unit ID[9]	Emission Unit Description	Installation Date	Maximum Design Capacity & Permitted Fuel Types[10]
EU20	Clarke fire pump - Model JU4H-UFAD58 John Deere engine - Model 4045 Serial #PE4045L273937	2015	1.20 MMBtu/hr (110 bhp; 82 kW) ULSD – equivalent to 8.7 gal/hr
EU21	Kohler emergency generator set - Model 40REOZJC John Deere engine - Model 4024HF285B Serial #SGM32DG5J	2015	0.47 MMBtu/hr (80 bhp; 60 kW) ULSD – equivalent to 3.4 gal/hr

POLLUTION CONTROL EQUIPMENT

BACT Analysis

Pursuant to RSA 125-C:10-b, I(a), Best Available Control Technology (BACT) means an emission limitation based on the maximum degree of reduction for each air contaminant that would be emitted from any device that the department, on a case-by-case basis, taking into account energy, environmental, public health, and economic impacts and other costs, determines is achievable for such device through application of production processes or available equipment, methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such air contaminant.

The objective of a BACT analysis is to identify all potential control technologies and then evaluate the control options for technical feasibility, control effectiveness, average cost effectiveness, incremental cost effectiveness, environmental impacts and energy impacts. EPA's "Top Down" approach, described in EPA's draft "New Source Review Workshop Manual", and consisting of a five step approach was used in determining BACT for PFC emissions. The five steps are listed below:

1. Identify all potentially available control options (Table 4);
2. Eliminate technically infeasible control options (Table 4);
3. Rank remaining control technologies by control effectiveness (Table 4);
4. Evaluate the most effective controls and document the results (Tables 4 and 5); and
5. Select BACT.

Table 4 lists the potential control technologies and the BACT analysis information submitted as part of the application. Table 5 is the cost effectiveness information also submitted by SGPP in the application.

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9 EU18 and EU19 (2 fire pumps with Detroit Diesel engines) are owned by the property owner but historically operated by SGPP. SGPP decommissioned the engines on or about August 28, 2015, returned them to the property owner, and replaced them with EU20 and EU21.

10 The hourly fuel rates presented in Table 3 are set assuming a heating value of 137,000 Btu/gal for ultra-low sulfur diesel (ULSD). The fuel consumption and maximum power ratings for each engine come from their respective engine specification sheets which also state that both engines are US EPA Tier 3 certified.

Table 4 – Best Available Control Technology (BACT) Analysis

Potentially Available Control Options	**Technically Feasible? (Y/N)[11]**		**Typical VOC Control Effectiveness[12]**	**Evaluate Most Effective Controls**		
				Energy Impact	**Environmental Impacts**	**Cost Effectiveness**
Regenerative Thermal Oxidizer (RTO)	Pollutants are oxidized at high temperature to form combustion products	Y – Provides projected high destruction efficiency with best thermal efficiency of the oxidizer options	95 – 99%	Significant amount of natural gas and electricity	Resulting in emissions of criteria pollutants including NOx, VOCs and CO_2	$46,700/lb
Recuperative Thermal Oxidizer	Pollutants are oxidized at high temperature to form combustion products (Includes heat recovery)	Y – Similar control efficiency as RTO; however, significantly lower thermal efficiency which would result in operating costs well in excess of RTO	95 – 99%	Less thermal efficiency than Regenerative Thermal Oxidizer for same % reduction in PFCs. Additionally, reduced thermal efficiency would result in an increase in fuel usage which would increase criteria pollutant emissions.		
Catalytic Oxidation	Similar to RTOs but process gas passes from flame area through catalyst bed to lower the activation temperature for oxidation	N – Catalytic systems are susceptible to catalyst poisoning, blinding and fouling especially in applications with particles and moisture	90 – 99%			
Filtration Systems	Designed to remove fine particulate matter (fiberbed mist collection system piloted at facility in 2018)	Y – Utilized at other similar facility; limited efficiency during 2018 stack test; questionable effectiveness for all PFCs	<90% based on NH stack testing 88% total for measured PFAS based on NY stack testing	High electrical and energy demand	Limited component life; disposal issues for components and spent water	$44,000/lb
Adsorption	Gas molecules pass through a bed of solid particles where they are adsorbed onto the adsorbent (typically activated carbon)	N – Effluent streams that contain particulates and moisture create the potential for compromising the adsorbent material which reduces efficiency	90 – 95%			

11 Technical feasibility for BACT is evaluated based on technology that must both be available and applicable. If a technology is deemed infeasible, it is no longer considered part of the BACT analysis. Those controls identified as infeasible in Table 4 have shaded columns once that technology has been eliminated in the BACT analysis.

12 Since control equipment has not historically been evaluated for PFC removal, the control effectiveness values are based on typical VOC control values except for filtration systems. Information obtained on VOC control effectiveness comes from EPA Air Pollution Control Technology Fact Sheets and EPA Control Techniques for VOC Emissions from Stationary Sources. For the filtration system, SGPP piloted a fiberbed mist collection system in April, 2018 that demonstrated emission reductions for some PFCs but for other PFCs the device did not achieve significant levels of control. NY also had stack testing conducted in 2016 on a PTFE coating line controlled by a fiberbed mist collection system.

Table 4 – Best Available Control Technology (BACT) Analysis						
Potentially Available Control Options	**Technically Feasible? (Y/N)[11]**		**Typical VOC Control Effectiveness[12]**	**Evaluate Most Effective Controls**		
				Energy Impact	**Environmental Impacts**	**Cost Effectiveness**
Concentrator System with Oxidation	Concentrate organic compounds in air stream to reduce volume prior to oxidizer	N – Similar issues as adsorption technologies plus the potential inability to desorb any captured pollutants thereby reducing efficiency	Unknown but expected to be low due to PFC chemical and physical properties			
Absorption (Scrubber)	Transfers soluble components of gas stream into liquid through mass transfer	Y – While concentration in gas stream is low, PFCs have a high solubility in water	70 – 99%	Electrical demand for pumping water	Disposal issues for spent PFCs contaminated water generated	Spent water treatment costs in excess of $21M/yr
Condensation	Converts a gas or vapor to liquid by sufficiently lowering its temperature and/or increasing its pressure – depends on condensation point of the compound being controlled	N – Technology is only effective under high concentration gradients which the influent gas stream in this application is not	Unknown but expected to be low since exhaust is a combination of particulate and vapor and low inlet concentration of contaminants			
Bio-filtration	Gases containing biodegradable organic compounds are vented through a bed of active material that biodegrades the organics to carbon dioxide (CO_2) and water (H_2O)	N – Large footprint, maintenance intensive, operates in narrow bands of temperature and pressure, not adept at responding to swings in pollutant loading and are primarily used for odor control	80 – 90%			
Material Substitution or Reformulation	Change the use of raw materials containing PFCs to materials that do not contain PFCs	N – Lack of suitable substitute materials although SGPP is committed to further R&D	Variable			

Cost Effectiveness Data[13]

Table 5 – Cost Effectiveness of Control Equipment

Control Alternative	Capital Investment	Annual Operating Cost[14]	Total Annualized Cost	Control Efficiency[15]	Cost Effectiveness ($/lb)
RTO	$3.0 MM	$450 K	$840 K	90%	$46,700
Fiberbed mist collection system	$2.4 MM	$480 K	$792 K	90%	$44,000

SGPP Proposed BACT: Regenerative Thermal Oxidizer

SGPP is proposing to install a regenerative thermal oxidizer as BACT that will be used to reduce emissions of PFCs from several existing sources at the facility (EU01-EU08, EU12, EU13, EU15, EU16 and EU22-EU26). The process vent emission streams will be collected and tied into a header system that will deliver process exhaust from the facility to a centralized control system proposed for location to the rear of the site. By using this approach, SGPP would eliminate the process vent discharges currently located on the roof. A significant co-benefit of the RTO is its ability to reduce emissions of PFAS, regardless of their carbon chain length. Therefore, an RTO would be effective for the current PFCs that have AGQS, as well as those for which either AGQS or surface water quality standards (SWQS) are promulgated in the future.

Properly designed thermal oxidizers include the following:

1. A sufficiently high design temperature for the combustion chamber to ensure rapid and complete oxidation.
2. Adequate turbulence to obtain good mixing between combustion air, pollutants, and hot combustion products from the burner.
3. Sufficient residence time at thermal oxidizer temperature for complete combustion.

With the correct operating parameters, most organic compounds can be oxidized. Since the process vent emission streams will contain VOCs, the resultant emissions from the destruction of VOCs will be CO_2 and water. For the non-VOC component of the process vent emission streams (i.e. PFCs and other PFAS), complete destruction of fluorinated compounds will result in HF emissions as well.

SGPP states in the application that they are engaged with vendors to explore the use of a three-chamber design for the purpose of maximizing the efficiency of the unit by minimizing any short-circuiting of the RTO. When employing a two-chamber system, there are two beds which alternate in service from "treatment" to "heat recovery" and then switch at a pre-determined frequency. During each chamber switch, there is a brief transition period where a small volume of untreated air may bypass the treatment zone and vent direct to the atmosphere. This is inherent to the two-chamber RTO design. In a three-chamber system, there is a third bed which serves to receive the small volume of untreated air that is then introduced to the treatment bed during the subsequent cycle. Therefore, there are no losses during a chamber transition and emission reduction is maximized.

SGPP is proposing to have the RTO vendor design the RTO with a combustion chamber temperature of 1600°F with a minimum pollutant residence time of 0.75 seconds. According to the application, the design bid documents will also specify that the RTO be designed with the capability to operate at temperatures in excess of 1600°F and upwards of 1800°F to ensure the desired level of destruction is achieved.

NHDES has reviewed literature and networked with state and federal agencies throughout the U.S. and has not identified the application of a RTO for PFC destruction from a fabric coating operation like SGPP. SGPP also states in Attachment C of their application that they did an investigation into potentially available control technologies for the BACT analysis and did not identify equivalent operations in their search. The closest comparison would be the thermal oxidizer with 4-stage scrubber system being installed at the Chemours facility in Fayetteville, NC. However, that facility is not a fabric coating operation but a manufacturer of products such as dispersions and the design of the thermal oxidizer in NC is

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13 Specific information and basis of economic feasibility is provided in Attachment C of the application.
14 Operating costs are based on 8,760 hours/year of operation.
15 Control efficiency used for estimating purposes only, given actual data regarding removal efficiencies for PFCs are currently not well defined.

different than that proposed at SGPP. In addition to the differences between the processes at Chemours and SGPP, the regulatory requirements associated with each location are different.

The Chemours thermal oxidizer is required by permit and a Consent Order to be operational by December 31, 2019 with initial performance testing results required to be submitted to NC Department of Environmental Quality within 90 days of installation. The Chemours thermal oxidizer is designed to operate at 1800°F with a residence time of >1.2 seconds. The performance test in NC will provide insight into what the minimum operating temperature will be necessary for the Chemours thermal oxidizer with its designed residence time in order to achieve the destruction efficiency of 99.99% as mandated by the permit and Consent Order issued to Chemours.

Studies of potential sources of PFAS in the atmosphere from waste incineration of fluorotelomer-based polymers in two laboratory-scale studies[16] [17] and PTFE in a rotary kiln test facility[18] have indicated that operating at typical waste incineration conditions (approximately 1000°C or 1832°F for 2 seconds residence time) does not result in a detectable level of PFOA or a significant source of studied PFAS. These studies were for the incineration of solid materials. In addition, these operating conditions of time and temperature were set for the laboratory scale studies to evaluate typical waste incineration conditions and not to determine the minimum operating temperature and residence time for PFAS destruction. NHDES believes the laboratory-scale studies may have been the result of the 2005 Enforceable Consent Agreement for Laboratory-scale Incineration Testing of Fluoropolymers between EPA and the Fluoropolymer Manufacturers Group[19].

<u>NHDES' Determination Pursuant to RSA 125-C:10-e</u>

RSA 125-C:10-e has a two-part requirement for sources that are subject to the regulation. First, BACT must be established pursuant to RSA 125-C:10-b, I(a). Second, the application of BACT cannot cause or contribute to or have the potential to cause or contribute to an exceedance of an AGQS or SWQS as a result of the deposition of the contaminant from the air. Therefore, the following outlines NHDES' determination for both parts of the regulation:

<u>NHDES' BACT Determination</u>

Based on the review of the limited information on incineration of PFC compounds and in consultation with EPA, NHDES agrees that a three-chamber RTO would constitute the best available control technology for the control of PFCs from the facility. The RTO parameters of residence time and turbulence will be inherent to the design of the RTO as proposed by the vendor that SGPP selects and the emission limitations and degree of emission reductions required by the permit. SGPP's proposed RTO operating temperatures of 1600 - 1800°F are within the parameters suggested by the afore mentioned research. Therefore, NHDES has determined that the RTO shall be required to meet a minimum temperature of 1800°F with the ability to reduce that temperature if stack testing conducted in accordance with Env-A 800 and the permit indicates that the device can achieve the permitted performance requirements outlined below at a lower temperature.

1. The RTO is limited by permit condition to a minimum control efficiency of 90%, by weight for each PFC. Stack testing using Modified Method 5 (MM5) has been conducted at SGPP in the past. The MM5 methodology and existing analytical standards for PFOA, PFOS, PFNA and PFHxS allow for the quantification of inlet and outlet emission rates and therefore, a control efficiency for the RTO can be calculated from stack test information for these four PFCs. However, the lower the inlet concentration of an individual PFC to the RTO, the more difficult it is to measure an accurate control efficiency for the RTO for that PFC. A possible surrogate for individual PFC control efficiency could be a total organic fluoride (TOF) inlet and outlet measurement since the amount of total PFAS loading is expected to be sufficient to the RTO for measuring an accurate destruction efficiency. However, since this stack testing methodology for TOF is still in the development stages, it is not a requirement in the

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16 Taylor, P.H., Yamada, T., Striebich, R.C., Graham, J.L., & Giraud, R.J. (2014). Investigation of waste incineration of fluorotelomer-based polymers as a potential source of PFOA in the environment. Chemosphere 110, 17-22.

17 Yamada, T., Taylor, P.H., Buck, R.C., Kaiser, M.A. & Giraud, R.J. (2005). Thermal degradation of fluorotelomer treated articles and related materials. Chemosphere 61, 974-984.

18 Aleksandrov, K., Gehrmann, H.J., Hauser, M., Mätzing, H., Pigeon, D., Stapf, D. &Wexler, M. (2019). Waste incineration of polytetrafluoroethylene (PTFE) to evaluate potential formation of per- and poly-fluorinated alkyl substances (PFAS) in flue gas. Chemosphere 226, 898-906.

19 <u>Final Enforceable Consent Agreement and Testing Consent Order for Four Formulated Composites of Fluoropolymer Chemicals; Export Notification</u>. 40 CFR Part 799 [OPPT-2003-0071].

permit at this time but an option for the future. [See *Deposition Modeling (PFCs)* later in the permit application review summary for the basis of the 90% efficiency limit.]

2. Given the possible issues associated with calculation of control efficiency as explained in #1 above, an alternative post-controlled emission limitation for PFOA, PFOS, PFNA and PFHxS was established based on the detection levels for PFAS observed during the three most recent stack tests conducted at SGPP. The samples collected during these stack tests were analyzed by two different labs and represent samples that were taken both with and without the use of an XAD resin. Typical detection levels of 1.0E-12 lb/dscf were seen and given the proposed maximum air flow of 70,000 scfm for the proposed RTO, this equates to a post-controlled emission level of 4.0E-06 lb/hr for each PFC. The following equation was used to calculate this post-controlled emission limitation:

$$Post-controlled\ emission\ limit\ \left(\frac{lbs}{hr}\right) = 1x10^{-12}\left(\frac{lb}{dscf}\right) * 70{,}000\ \left(\frac{scf}{min}\right) * 60\ (\frac{min}{hr})$$

The permit allows for the facility to demonstrate compliance with either #1 or #2 above, based on stack testing results. [See *Additional Future Stack Testing Requirements* later in the permit application review summary for a detailed explanation of methods and sampling locations of initial and periodic stack testing requirements.]

NHDES Cause or Contribute Determination [RSA 125-C:10-e]

To address the issue of "Cause or Contribute", the permit also contains limits on annual maximum allowable PFC emissions which were developed for each of the PFCs for which an AGQS currently exists. These limits are derived from the current method detection limits for the isotope dilution method for PFAS in groundwater, precipitation and infiltration rates for the Town of Merrimack, and the results of the air deposition modeling conducted by Barr and revised by NHDES (modeling memo) based on the maximum predicted deposition scenario. [See *Deposition Modeling (PFCs)* later in the permit application review summary for detailed explanation of how these emission limitations were developed.]

The maximum annual PFC emission limits are 0.075 lbs/yr PFOA, 0.048 lbs/yr PFOS, 0.024 lbs/yr PFNA, and 0.015 lbs/yr PFHxS.

Air Pollution Control Equipment Monitoring Plan

Pursuant to Env-A 810, *Air Pollution Control Equipment Monitoring Plan*, an air pollution control monitoring plan was submitted with the application as Attachment G. Because the proposed control device is in the preliminary design phase, not all information was provided in the plan. Some of the items (model and serial number of control device) are not critical to the design and functionality of the control equipment. However, because some design and operating parameters of the proposed control device are yet to be determined, NHDES is requiring as a condition of the permit, a monthly update report of the Air Pollution Control Equipment Monitoring Plan which shall include the following information:

1. *Manufacturer of Control Device:* SGPP shall submit a status update on selection of the manufacturer of the air pollution control device.
2. *Model and Serial Number of Control Device:* SGPP shall submit information once model and serial numbers are known.
3. *Description of Control Device and How It Operates in the Process:* SGPP shall submit documentation from the manufacturer of the air pollution control device including schematics, documentation pertaining to the design and detailed description of the control device and how it will be operated.
4. *The Capture Efficiency of the Device and Method of Determination*: Attachment D of the application describes the assessment of tower capture efficiency prepared by Environmental Resources Management (ERM) based on information obtained by SGPP staff for the devices that will be tied into the RTO (EU01-EU08, EU12, EU13, EU15, EU16, EU22-EU26). This assessment was conducted to ensure maximizing capture efficiency into the existing equipment to minimize or eliminate fugitive emissions. EU01-EU05, EU15, EU16, and EU24 were found to have sufficient capture. EU07 and EU08 are located in the same room which is operated as an enclosure with inward velocity of greater than 200 ft/min. EU25 and EU26 have no openings in equipment and their inherent design provides for total capture. EU22 had sufficient inward air velocity and capture. The remaining devices required improvements to maximize capture as outlined below:

a. Tower improvements were determined to be necessary for the MP (EU13), MG (EU12) and QX Towers (EU06) as well as the Chemsil Coater (EU23). Additionally, the MA and MB Towers required upgrades that were completed in 2018.
b. Tower improvements were scheduled for MP and MG Towers in 2019.
c. QX Tower improvements are scheduled in conjunction with the control device connection.
d. No date was given for improvements to the Chemsil Coater.
e. SGPP shall conduct capture efficiency testing pursuant to Env-A 805 during stack testing. In addition, SGPP shall submit a status update on tower improvements for maximizing PFC capture efficiency conducted to date and going forward until construction is complete.
f. The permit includes an annual inspection of the thermal oxidizer and the ductwork from each source (EU01-EU08, EU12, EU13, EU15, EU16, EU22-EU26) leading to the RTO. SGPP shall also submit a Total Enclosure Monitoring and Capture Efficiency Verification Plan (for each device, as applicable) so that fugitive emissions are minimized or eliminated.

5. *The Control Efficiency of the Device and Method of Determination:* Once the manufacturer of the RTO has been selected, SGPP shall submit documentation from the manufacturer of the air pollution control device regarding control efficiency guarantees and proposed methods of determination of the control efficiency of the device. In addition, SGPP has requested that the facility have the flexibility to use the control device for compliance with Env-A 1200, *Volatile Organic Compounds (VOCs) Reasonably Available Control Technology (RACT)*. Env-A 1207.03(c) requires a minimum VOC control efficiency of 90%. Therefore, additional VOC testing requirements outlined in Env-A 800 will be required to allow for this option.[20]

6. *Operational Parameters of the Device, and Normal Ranges, and Range During Start-up or Shutdown Conditions:* In the application, SGPP proposed a minimum combustion chamber temperature of 1600°F and maximum inlet flow rate of 70,000 scfm along with proposed start-up and shutdown procedures. However, as noted above, NHDES has determined that the minimum combustion chamber temperature shall be 1800°F unless stack testing demonstrates otherwise. The permit requires SGPP to operate the RTO at all times the coating towers or auxiliary equipment (EU01-EU08, EU12, EU13, EU15, EU16 and EU22-EU26) are operating and in accordance with the start-up and shutdown conditions outlined in the monitoring plan. SGPP shall submit updated operational parameters of the device and normal ranges from the manufacturer of the air pollution control device.

7. *Description of Data Recording or Recordkeeping, Parameter Setpoints and Alarms, and Operator Responses to Malfunctions of the Control Device to Prevent Uncontrolled Emissions:* The proposed operating parameter monitoring of at least once every 15 minutes for combustion chamber temperature and inlet flow rate that was submitted as part of the application is currently sufficient. SGPP shall submit updated information pertaining to data recording or recordkeeping, parameter setpoints and alarms, and operator responses to malfunctions from the manufacturer of the air pollution control device.

8. *Manufacturer's Recommended Procedures for Operation:* SGPP stated in the application that it intends to implement the operational recommendations of the selected RTO manufacturer to ensure the control device achieves the highest level of control possible. SGPP shall submit documentation from the manufacturer of the air pollution control device regarding recommended procedures for operation.

9. *Manufacturer's Recommended Schedule for Service, Maintenance and Calibration of the Device:*

   a. SGPP intends to develop and implement a service, maintenance and calibration program based on the selected RTO manufacturer's recommendations. SGPP shall submit documentation from the manufacturer of the air pollution control device regarding recommended schedule for service, maintenance and calibration of the device.
   b. In addition to the maintenance of the RTO, SGPP shall submit additional information pertaining to the maintenance of the process vent emission streams that will be collected and tied into a header system.

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[20] It should also be noted that the raw materials SGPP currently uses meet the VOC content limits of Env-A 1207. The inlet concentration of VOCs to the RTO will likely be low which leads to difficulty in measuring an accurate destruction efficiency for the RTO for VOCs.

This information shall include methods for keeping the vents clear of char material, including but not limited to insulation, cleaning ports, cleaning frequency and methodology and any proposed operation and maintenance of auxiliary equipment necessary to ensure the process vent emission streams remain clear of char material.

10. *Other Operational Parameters Affecting the Ability of the Device to Control Emissions:* As the design process begins, SGPP acknowledges that any parameters that are identified during the process will be included in subsequent versions of the monitoring plan and will be necessary to submit to NHDES.

    a. SGPP shall submit documentation from the manufacturer of the RTO regarding any other operational parameters affecting the ability of the device to control emissions, as necessary.
    b. SGPP conducted a wet-weather and source investigation sampling event in September 2018 on the stormwater system. As a result of the event, multiple work practices were put in place as outlined in both the December 20, 2018 roof cleaning SOP that SGPP submitted and the January 22, 2018 letter with supporting documentation regarding work practices SGPP implemented for roof inspections, cleanings and maintenance of stormwater systems.
    c. During the November 28, 2018 meeting with SGPP, NHDES suggested further analysis of the roofing material to determine the level of residual PFAS that might be leaching off the roof and contributing to the PFAS levels in the stormwater system. In the January 22, 2018 letter, SGPP was concerned about a number of technical challenges to sampling the roofing material, such as a lack of standard test methods and likely matrix interferences in the analysis of roofing material. SGPP also stated that "SGPP is currently evaluating the installation of air emissions controls that would mitigate potential PFAS emissions and eliminate the potential for char to be deposited on the rooftop. If the installation and operation of air emissions controls do not adequately address PFAS concentrations in rooftop stormwater, SGPP will consider further evaluations to characterize rooftop conditions such as pursuing unconventional analytical techniques to assess PFAS absorption by roofing materials and potential leachability."
    d. NHDES sent a letter to SGPP on February 22, 2019 regarding the *September 2018 Unvalidated Wet-Weather and Source Investigation Sampling Event Data Submittal*. In the letter NHDES conveyed concern over the results of the roof drain sampling containing highly elevated levels of PFAS that are an order of magnitude (or more) greater than the 70 ng/L standard for PFOA and PFOS. NHDES went on to state that the cause of the high levels of PFAS in the roof runoff may be due to accumulated dry deposition on the roof (including air emissions and char deposits), leaching of PFAS that absorbed onto building materials from long-term air emissions, or some other source. The roof runoff containing elevated PFAS has the potential to contaminate groundwater via infiltration into the ground where water drips/flows off the roof onto the ground surface and where exfiltration from the stormwater system where the infrastructure is/was cracked or otherwise compromised.
    e. SGPP states in the BACT application that control of the applicable process sources via a centralized control system "would eliminate process vent discharges currently located on the roof level and thereby reduce the potential for target compounds in roof stormwater runoff."
    f. If PFAS contaminates stormwater (and in turn groundwater) by a process other than ongoing air deposition from the existing stacks, installation of air emission controls alone may not eliminate the source of PFAS in stormwater from the roof of the facility.
    g. As part of the implementation of the BACT requirements and to verify SGPP's assertion that air pollution controls will mitigate the stormwater issue, NHDES requires that SGPP conduct another round of stormwater source sampling (e.g. all previous stormwater sampling sites including the roof drains) and roof wipe analysis. This analysis and submittal of a final report shall be done within 6 months of the BACT controls becoming operational in order to ascertain if continued elevated PFAS compounds are found in the stormwater and to determine if there is an ongoing source of PFAS (e.g. evaluation of the roofing material) other than from the stacks.

SGPP shall submit a final approvable *Air Pollution Control Equipment Monitoring Plan* to the department no later than 60 days after completion of construction and installation of the RTO.

HF Scrubber

- See the May 1 and June 20, 2019 letters to SGPP regarding NHDES' concerns about the potential for HF emissions coming from the utilization of a RTO for the destruction of PFAS compounds.
- See *EMISSION CALCULATIONS/EMISSION STACK TESTING RESULTS: Coating Towers – Total PFAS, PFOA, Total Fluoride and Hydrogen Fluoride Emission Rates* for further HF calculations and emission rates.
- Based on the Env-A 1400 compliance demonstration for HF outlined in *Dispersion Modeling (RTAPs)* and Table 12 below, an HF scrubber has been determined to not be required to be installed at this time. However, NHDES remains concerned that the calculations of current PFAS emissions from the facility and potential HF emissions from the RTO are an underestimation as outlined in *EMISSION CALCULATIONS/EMISSION STACK TESTING RESULTS: Coating Towers – Total PFAS, PFOA, Total Fluoride and Hydrogen Fluoride Emission Rates* below.
- As stated in the May 1, 2019 letter to SGPP, in order to ensure the expeditious installation of BACT controls, NHDES requested SGPP submit a pre-test protocol for the stack testing of HF emissions from the proposed RTO. SGPP submitted the protocol as part of the May 30, 2019 submittal to NHDES. A more thorough and detailed pre-test protocol will be required to be submitted pursuant to the draft permit and in accordance with Env-A 800.
- The draft permit includes a requirement that SGPP conduct stack testing for HF emissions from the RTO in accordance with Env-A 802, with NHDES staff present and in accordance with a division approved pre-test protocol. In addition, the draft permit requires SGPP update and submit an Env-A 1400 compliance demonstration based on final as-built RTO emission parameters and the results of the stack testing for HF. SGPP should proceed with the design of an HF scrubber as part of the RTO design process to ensure the facility is ready to implement the HF scrubber as expeditiously as possible, if needed.

Additional Future Stack Testing Requirements

The following stack testing requirements were discussed in previous sections of this summary:

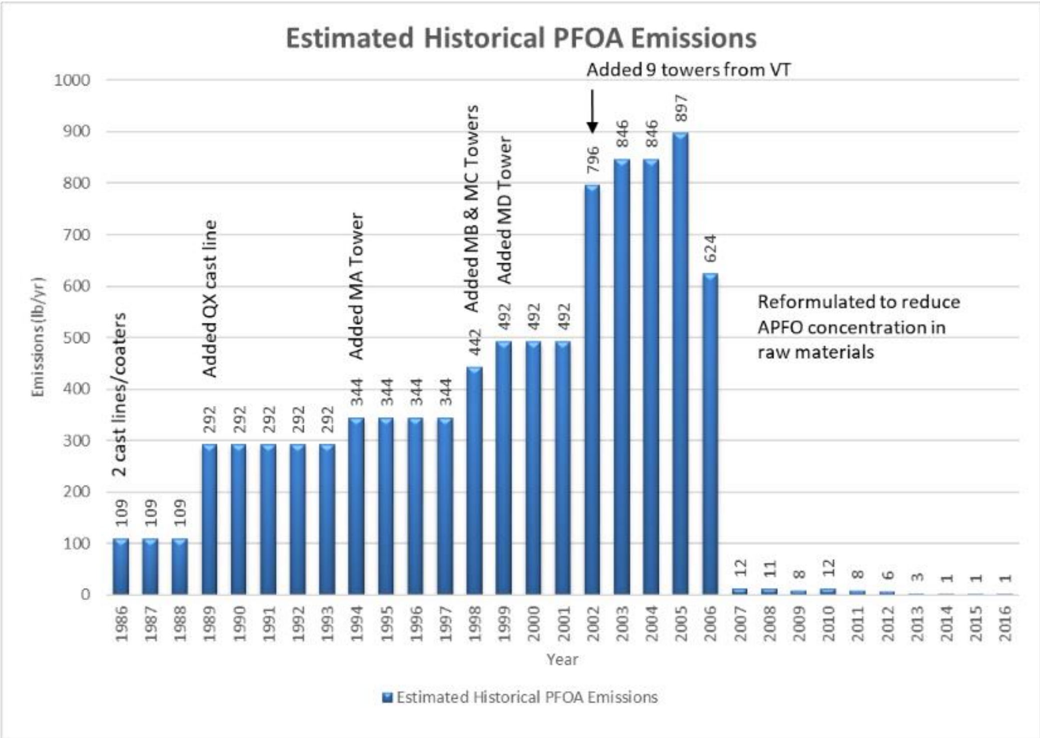
1. Capture efficiency of the towers (EU01-EU08, EU12, EU13, EU15, EU16, EU22-EU26) to minimize fugitive PFAS emissions pursuant to Env-A 805 (Method 204);
2. Pre- and post-RTO stack testing to determine the control efficiency of the RTO, post-control emission rates for PFOA, PFOS, PFNA and PFHxS, and to establish operating parameters for the RTO (Modified Method 5 and any NHDES approved alternatives);
3. Stack testing post-RTO for HF emissions for the Env-A 1400 compliance evaluation (Method 26A); and
4. Capture and control testing requirements for VOC RACT purposes (Method 204 and Method 25 or 25A) (EU01-EU08, EU12, EU13, EU15-EU17).

Additional initial and periodic stack testing requirements are included in the permit. Given that stack testing methodologies are currently being developed for PFAS, the permit allows the owner or operator or their stack testing representative flexibility in the stack testing approaches including proposing alternatives to the stack testing methodologies through coordination with NHDES as part of the pre-test process.

EMISSION CALCULATIONS/EMISSION STACK TESTING RESULTS

Coating Towers – Historical PFOA Emission Rates

- See the September 26, 2018 NHDES letter issued to SGPP for historical PFOA emissions and stack test results.



Coating Towers – Total PFAS, PFOA, Total Fluoride and Hydrogen Fluoride Emission Rates

- Stack testing was conducted at SGPP in April and May, 2018 by Barr with analysis conducted by SGS Laboratories. The testing was conducted on the MA and MS Tower exhausts as well as on the QX Tower. The testing on the QX Tower was simultaneously at the inlet and outlet of a pilot-scale control device to determine the control efficiency of the pilot-scale fiberbed mist collection system rented from Air Clear, LLC by SGPP for the stack test. The inlet stream to the pilot-scale control device is considered indicative of the uncontrolled emissions from the QX Tower.
- During the same stack test in 2018, samples were sent to EPA Office of Research and Development (EPA ORD) for non-targeted analysis of PFAS compounds. On October 4, 2018, NHDES received Report #4 which contained results of SUMMA canister samples. The analysis of the SUMMA canisters tentatively identified 12 PFAS compounds. On June 20, 2019, NHDES received Report #6 from EPA ORD which contained stack test results of front half filter, XAD resin trap and back half filter analysis conducted by EPA ORD. Across the three towers sampled, EPA ORD detected 190 PFAS compounds and tentatively identified 89 of them.
- On June 20, 2019, NHDES issued a letter to SGPP regarding the EPA ORD analytical results. In the letter, NHDES quantified the 89 PFAS compounds that were tentatively identified by EPA ORD in Report #6. The letter outlined why NHDES believes this is an underestimation of the current PFAS emissions from the facility. NHDES used the same methodology as the application to convert PFAS compounds to HF, but based the calculation on the estimated 89 PFAS compounds that were tentatively identified by EPA ORD.
- In the SGPP letter dated August 1, 2019, SGPP's consultant, C.T. Male Associates questioned the validity of the PFAS emission calculations presented in the NHDES letter dated June 20, 2019. In Table 1 of the submittal, C.T. Male recalculated the total fluoride emission rate using the current estimated fluoride emission rate of 0.0718 lb/hr and the 10 PFAS compounds contribution at 0.0168 lb/hr. The PFAS compound contribution reflects the

total lb/hr PFAS emissions reported in Attachment B.7 of the application at an assumed 70% fluoride contribution based on the 4 highest detected PFAS ranged from 62 – 68% from the 2018 stack test report. The total fluoride emission rate of 0.0886 lb/hr is the value Barr used in the air dispersion modeling submitted August 1, 2019.

- Table 6 below contains comparisons of the SGPP application submittal and NHDES' calculations for hourly, actual and potential emissions of total PFAS, PFOA, total fluorides and hydrogen fluoride based on the various calculation methodologies outlined above and in the footnotes.

Table 6 – Comparison of Estimated Emissions[21]

Pollutant		SGPP March 26, 2019 Application Emission Rates			NHDES June 20, 2019 Calculated Emission Rates[22]			SGPP August 1, 2019 Revised Emission Rates[23]		
		Hourly	Actual	Potential[24]	Hourly	Actual	Potential	Hourly	Actual	Potential
		(lb/hr)	(lbs/yr)		(lb/hr)	(lbs/yr)		(lb/hr)	(lbs/yr)	
Total PFAS		0.024	78.05[25]	*210*	0.27	864	2,326	N/A	N/A	N/A
PFOA (as Ammonium Perfluorooctanoate)		2.28E-04	0.74[26]	*2.0*	N/A	N/A	N/A	N/A	N/A	N/A
Total Fluorides (F)	Current[27]	0.0718	235	*629*	0.0718	235	629	0.0718	N/A	*629*
	Current	0.0476[28]	N/A	*417*	N/A	N/A	N/A	N/A	N/A	N/A
	Post RTO	0.0158	N/A	*138*	0.17	N/A	1,472	0.0168	N/A	*147*
	TOTAL F[29]	0.0635	N/A	*555*	0.24	N/A	2,101	0.0886	N/A	776
Hydrogen Fluoride (HF)	Current	*0.05*	N/A	*441*	0.076	N/A	664	N/A	N/A	N/A
	Post RTO	*0.017*	N/A	*146*	0.18	576	1,550	N/A	N/A	N/A
	TOTAL[30]	0.0670	N/A	587	0.26	N/A	2,278	N/A	N/A	N/A

21 N/A in Table 6 means either the information wasn't submitted by SGPP or wasn't calculated by NHDES for the purpose of this table.

22 See NHDES letter dated June 20, 2019 for basis of calculations for PFAS and HF from PFAS contribution through RTO. NHDES also assumed current total fluorides consistent with the emissions reported by Barr in the 2018 Barr stack test report. The June 20, 2019 NHDES letter presented HF emission rates, but after review of Env-A 1400 it was determined that the ambient air limits are established for hydrogen fluoride as fluoride and therefore Table 6 presents both total fluoride and HF emission rates.

23 See C.T. Male Associates letter dated August 1, 2019 where revised hydrogen fluoride as F emission rates were submitted for use in air dispersion modeling.

24 Potential annual emissions in Table 6 above were calculated by NHDES and are based on all the devices operating 24 hours/day and 365 days/yr.

25 Attachment B.6. of the application contains lb/hr and lb/yr estimates of the 10 PFAS compounds along with the assumptions and methodology of the emission calculations and are based on the September 2018 Barr stack test report submitted by SGPP. Annual actual emissions are calculated from short-term emission rates based on average operating hours per tower over the period 2012 – 2017. Where the application didn't estimate emissions for Table 6, NHDES calculated them and reported them in *italics*.

26 PFOA emissions were reported by Barr in the 2018 Barr stack test report which NHDES approved in a letter dated May 1, 2019.

27 During the 2018 stack test, Barr utilized EPA Method 13B to determine current fluoride emissions from the MS Tower. Attachment B.6. of the application contains lb/hr and lb/yr estimates of the total fluoride emissions as reported in the September 2018 Barr stack test report submitted by SGPP. These calculations utilized fluoride emission stack test result from the MS Tower (lb/dscf) in conjunction with each tower's stack flow rates.

28 Attachment B.7. of the application contains a different methodology to calculate fluoride emissions. In this case, the fluoride emission stack test result from the MS Tower in lb/hr was applied to all towers at SGPP based on the maximum processing rate of each tower (ft^2/hr). Changes to the coating tower parameters in August, 2019 had an effect on these calculations and therefore the values in Table 6 should be 0.453 lb/hr and 396 lbs/yr based on the new coating tower parameters submitted by C.T. Male on August 29, 2019. Total F would then change accordingly. However, this had no impact on the rest of the analysis since this method was less conservative than the method outlined in Footnote 28.

29 SGPP March, 2019 application used the lower of the two methods for calculating current fluoride emissions plus the contribution of 10 PFAS compounds through the RTO to calculate total fluoride emissions. The August 1, 2019 submittal from C.T. Male used the higher of the two methods for calculating current fluoride emissions and therefore the changes made in the August 29, 2019 submittal did not affect this analysis.

30 Installation and operation of an RTO for PFAS destruction will result in additional HF emissions. Therefore, Attachment B.7. also includes HF

<u>Coating Towers – Ammonia (NH_3) Emissions (RTAP)</u>

- During the 2018 stack test, Barr utilized EPA Method CTM 027 to determine ammonia emissions from the MS Tower. In the same manner that the application contained two approaches to calculating facility-wide fluoride emissions as outlined above, the application also used the same two approaches to calculate facility-wide ammonia emissions. The first approach results in a predicted facility-wide NH_3 emission rate of 0.0825 lb/hr or 270 lbs/yr (based on average hours of operation) and a potential annual emission level of 723 lbs/yr if all the devices operated 24 hrs/day and 365 days/yr. The second approach results in a predicted facility-wide NH_3 emission rate of 0.054 lb/hr or 474 lbs/yr for all towers combined.[31]

<u>Coating Towers – Additional RTAPs/HAPs</u>

- Attachment B.5. of the application contains the summary of additional RTAP/HAP emissions including the assumptions and calculations for estimating these emissions from the coating towers beyond those RTAPs/HAPs already outlined above. Actual annual emissions are calculated based on actual annual raw materials used (2012 – 2018), maximum individual RTAP/HAP concentration listed in the material safety data sheets for each raw material and assumes 100% gets released to the atmosphere. NHDES concurs with this methodology for calculating the actual annual emissions of the remaining RTAPs/HAPs.
- RSA 125-I, Air Toxic Control Act states that "No person shall operate any device or process at a stationary source that emits a regulated toxic air pollutant without a temporary or operating permit issued by the department in accordance with this chapter or RSA 125-C, provided, however, that no permit or permit application shall be required for any device or process at a stationary source exempted under RSA 125-I:3, III, or whose uncontrolled emissions of regulated toxic air pollutants do not exceed ambient air limits at or beyond the compliance boundary…"
- Uncontrolled emissions are defined as "any emission of a regulated toxic air pollutant from a device or process at a stationary source that is not subject to treatment or removal by pollution control equipment prior to being emitted to the ambient air, or is emitted to the ambient air in amounts which have not been limited by conditions in an enforceable permit or document." The assumption is that if uncontrolled emissions (i.e. no limit on hours of operation, no assumptions for bottlenecks, no accounting for destruction efficiency of a control device etc.) do not exceed the AALs, then no permit containing operating limits or installation of control equipment would be necessary to comply with the law.
- In Attachment B.8 of the application and later revised in the August 29, 2019 submittal, SGPP calculated potential RTAP emissions (i.e. uncontrolled emissions) to use in the Env-A 1400, *Regulated Toxic Air Pollutants* compliance demonstration by applying an annual scaling factor to actual RTAP emissions. However, this methodology employed an 80% bottleneck factor due to product changes and equipment limitations.
- On September 30, 2019, SGPP submitted a revised Env-A 1400 demonstration without the inclusion of the bottleneck factor. Table 7 below presents the highest actual and potential emission rates of each RTAP during the 2012 – 2018 timeframe without the bottleneck factored into the calculations.
- In addition, the emission rates detailed in the text above for PFOA, HF and NH_3 are included in the table below. Since PFOA (as Ammonium Perfluorooctanoate), HF and NH_3 are RTAPs, they must be evaluated against Env-A 1400, *Regulated Toxic Air Pollutants* standards.[32]
- See REVIEW OF REGULATIONS: State Regulations later in the permit application review summary for the Env-A 1400, RTAP compliance demonstration.

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emission calculations based on accounting for each fluorine atom from the PFAS converting to HF. Changes to the coating tower parameters in August, 2019 had an effect on these calculations as well and are reflected in the information submitted by C.T. Male on August 29, 2019.

[31] Changes to the coating tower parameters in August, 2019 had an effect on these calculations and therefore the values for the second approach should be 0.0514 lb/hr and 451 lbs/yr based on the new coating tower parameters submitted by C.T. Male on August 29, 2019. This did not change the Env-A 1400 compliance evaluation since the second approach was less conservative than the first approach.

[32] See *REVIEW OF REGULATIONS: State Regulations* later in the permit application review summary for Env-A 1400 evaluation (Table 14).

Table 7 – Coating Towers – RTAP and HAP Emissions[33]				
RTAP/HAP	**CAS #**	**Highest Actual Emission Rate (2012 – 2018)**	**Potential Emission Rate**	
		(lbs/yr)	**(lbs/yr)**	**(lb/hr)** [34]
Ethylene Glycol	107-21-1	3,733	8,208	0.937
Toluene	108-88-3	1,329	2,922	0.334
Isopropanol	67-63-0	132.9	292.2	0.0334
Ethanol	64-17-5	3.18	7.72	0.000881
1,4-Dioxane	123-91-1	6.68	14.69	0.00168
Benzene	71-43-2	0.032	0.096	0.000011
Polyethylene Glycol	25322-68-3	724.6	1,593	0.182
Tetrafluoroethylene	116-14-3	1,153	2,642	0.302
Methanol	67-56-1	45.37	130.39	0.0149
Methyl Ethyl Ketone	78-93-3	49.60	142.5	0.0163
n-Methyl-2-pyrrolidone	872-50-4	43.30	124.43	0.0142
Hexane	110-54-3	2.65	7.62	0.000869
PFOA (as Ammonium Perfluorooctanoate)	3825-26-1	N/A	2.0	2.28E-04
Hydrogen Fluoride[35]	7664-39-3	N/A	2,278	0.26
Ammonia	7664-41-7	270	723	0.0825

Antenna Cover Fabrication Area – RTAPs/HAPs

- Attachment B.2. of the application contains the assumptions used in the calculations and a summary of RTAP and HAPs emissions from the antenna cover fabrication area. Actual emissions are calculated based on actual raw materials used (2012 – 2018), maximum individual RTAP/HAP concentration listed in the material safety data sheets for each raw material and assumes 100% gets released to the atmosphere[36]. NHDES concurs with this methodology for calculating the actual annual RTAP/HAP emissions from the antenna cover fabrication area.
- Attachment B.2. of the application lists actual RTAP/HAP emissions (lbs/yr) for each year from 2012 – 2018. Table 8 below presents the highest actual emission of each RTAP/HAP during that six-year period.
- Attachment B.5 of the application lists actual and potential total HAP emissions from each year with potential emissions calculated by scaling up from typical operations of one 8-hr shift/day and 5 days/week to 24 hr/day and 7 days/week. NHDES concurs with this methodology for calculating the potential annual RTAP/HAP emissions from the antenna cover fabrication area. Table 8 below uses the same scaling methodology to calculate potential emissions from the highest actual emission rates listed.

[33] All compounds listed in Tables 7 and 8 are RTAPs. However, HAPs are denoted in *italics*.
[34] Hourly RTAP/HAP emissions (lb/hr) were calculated from annual RTAP/HAP emissions (lb/yr) using 8,760 hours/yr conversion except as noted for hydrogen fluoride and ammonia in the text on the previous pages.
[35] HF emission rates represent total HF (current HF + contribution from PFAS converting to HF from RTO).
[36] On September 30, 2019, C. T. Male submitted a revised Attachment B.2. regarding the conditions under which methylene diphenyl isocyanate (MDI, CAS #101-68-8) would become emitted from a process. Previously, SGPP had assumed that 100% of the MDI contained within the product was emitted in the antenna cover fabrication area. However, given that this compound is applied at room temperature and not at temperatures greater than 100°F per the literature and manufacturer, it is not anticipated that MDI is liberated from the material in use at SGPP.

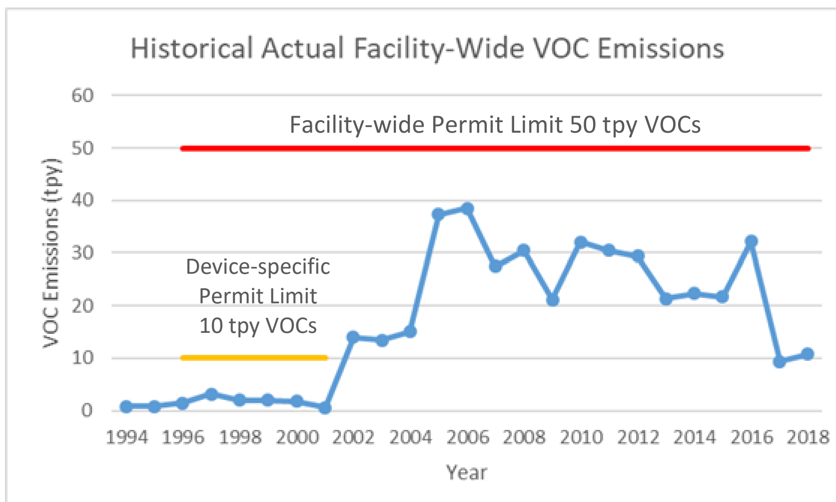
Table 8 – Antenna Cover Fabrication Area – RTAP and HAP Emissions				
RTAP/HAP	**CAS #**	**Highest Actual Emission Rate (2012 – 2018)**	**Potential Emission Rate**	
		(lbs/yr)	**(lbs/yr)[37]**	**(lb/hr)**
Ethyl Acetate	141-78-6	12.48	52.4	0.04
Toluene	108-88-3	1,021.68	4,292.8	3.44
Xylene	1330-20-7	1.56	6.6	0.005
Methyl Ethyl Ketone	78-93-3	247.20	1,038.7	0.83
Hexane	110-54-3	31.54	132.5	0.11
Ethyl Benzene	100-41-4	0.31	1.3	0.001
Benzene	71-43-2	0.03	0.1	8.0E-05

Facility-wide Hazardous Air Pollutants (HAPs)

The facility has been limited by permit conditions since the issuance of PO-BP-2607 and PO-BP-2697 on February 6, 1996 to synthetic minor status for hazardous air pollutants (< 10 tons of any one HAP and <25 tons of any combination of HAPs during any consecutive 12-month period). Based on current products used, the facility-wide potential to emit HAPs in total is 7.9 tpy with the highest contribution coming from toluene (3.3 tpy), ethylene glycol (3.3 tpy), and hydrogen fluoride (1.1 tpy based on future projected emissions after installation and operation of RTO).

Facility-wide Volatile Organic Compounds (VOCs)

Table 9 – Historical Actual VOC Emissions	
Year	**VOC Emissions (tpy)**
1994	0.8
1995	0.8
1996	1.5
1997	3.2
1998	2.0
1999	2.0
2000	1.8
2001	0.6
2002	14.0
2003	13.4
2004	15.0
2005	37.3
2006	38.5
2007	27.5
2008	30.5
2009	21.1
2010	32.1
2011	30.5
2012	29.4
2013	21.3
2014	22.3
2015	21.7
2016	32.2
2017	9.4
2018	10.8



Actual facility-wide VOC emissions are calculated based on a combination of actual formulation usage, VOC content listed in material safety data sheets and EPA Method 24 analysis of the raw materials for the coating towers and antenna fabrication area. Starting in 2016 when EU20 and EU21 were installed and permitted, the actual facility-wide VOC emissions also included contribution from these devices. However, they are rarely used and therefore, their contribution is negligible. Going forward it will be clearer in the permit that the VOC emissions from the process equipment burners will also be required to be included in annual emission calculations to demonstrate compliance with the facility-wide emission limits for VOCs.

[37] Hourly RTAP/HAP emissions (lb/hr) were calculated from annual RTAP/HAP emissions (lb/yr) using antenna cover fabrication area operating 8 hrs/shift; 1 shift/day; 3 days/week; 52 weeks/yr (1,248 hr/yr) conversion.

Prior to issuance of PO-BP-2607 and PO-BP-2697 in 1996, the permitted devices had device-specific annual VOC emission limits. Beginning in 1996, the facility was limited by permit conditions to synthetic minor status for VOCs (< 50 tons during any consecutive 12-month period) and was been limited by process to 10 tpy of VOCs for each individual device. The permit limit of 10 tpy of VOCs for each individual device was removed when permit FP-T-0075 was issued in 2001 for installation of 9 additional coating towers, thus subjecting the coatings to VOC RACT limitations. However, the facility-wide VOC emission limit of 50 tpy remained.

Criteria Pollutants from Combustion Units

Attachment B.3. of the March 26, 2019 application contains the summary of facility-wide and individual device criteria pollutant emissions as well as the emission factors and calculations. However, NHDES identified areas that needed correction as noted in the August 23, 2019 email to SGPP. In addition, SGPP submitted revised maximum heat input values for the process equipment on August 20, 2019. Updated emission calculations were submitted by C.T. Male on August 29, 2019, reviewed and corrected by NHDES and are included as Attachment 1 of this document and summarized in Table 10 below.

Table 10 – Facility-wide Emission Summary (Potential to Emit)

Combustion Sources	**NOx**		**SO_2**		**CO**		**PM**		**VOC**	
	(lb/hr)	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
Process Equipment Burners[38]	6.46	28.3	0.039	0.17	5.43	23.77	0.49	2.15	0.36	1.56
RTO Burner	0.97	4.25	0.0058	0.026	0.82	3.57	0.07	0.32	0.05	0.23
Clarke Fire Pump (EU20)	1.13	0.28	1.8E-03	4.5E-04	1.41	0.35	0.085	0.02	1.13	0.28
Kohler Emergency Generator (EU21)	0.51	0.13	0.0007	1.7E-04	0.55	0.14	0.04	0.01	0.51	0.13
#2 Fuel Oil-fired Boiler	0.22	0.98	0.0024	0.01	0.056	0.24	0.022	0.10	0.0038	0.017
Process Sources	**NOx**		**SO_2**		**CO**		**PM**		**VOC**	
	(lb/hr)	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
Process Equipment[39]										47.7
Facility-wide Annual PTE		33.9		0.21		28.1		2.6		49.9
Title V Threshold		50		100		100		100		50

DEPOSITION MODELING (PFCs)

- Historical air deposition modeling was conducted by NHDES and Barr as part of the initial PFAS investigation.
- On May 30, 2019, SGPP submitted an air deposition modeling report in accordance with the protocol submitted in Application #18-0227. The purpose of the air deposition model was to address the “Cause or Contribute” requirement of NH Statute RSA 125-C:10-e: *Requirements for Air Emissions of Perfluorinated Compounds Impacting Soil and Water*.
- NHDES reviewed the May 30, 2019 Barr modeling and summarized the conclusions in a modeling memo dated August 1, 2019. The NHDES modeling memo includes both Method 1 and Method 2, maximum and average unit impact rates for the reasonably likely design and the maximum predicted deposition scenarios modeled by Barr. The maximum predicted deposition scenario using Method 2 predicts the worst case deposition potential and was used in the following analysis. This is a very conservative approach to predicting potential future, post-control, deposition rates given the uncertainty of the inputs to and the methodology for deposition modeling, the use of the

38 EU01-EU06, EU12, EU13, EU15, EU16, EU22, EU24 & EU26
39 EU01-EU08, EU12, EU13, EU15-EU17, EU22-EU26

worst case exhaust parameters proposed by SGPP, and the evaluation of the impacts for an entire geographical area based only on the highest predicted deposition rate for one location. This worse case unit impact rate can be used to calculated maximum predicted deposition rates for various PFCs using the following formula:

$$Maximum\ Deposition\ Rate\ ((\mu g/m^2)/yr) = Emission\ Rate\ \left(\frac{g}{s}\right) * 0.386\ ((g/m^2)/yr\ per\ g/s) * 1{,}000{,}000\ (\frac{\mu g}{g})$$

- The Barr analysis (as summarized in Table 4 of the NHDES modeling memo) determined annual deposition rates based on annual PFC emission rates for the four PFCs that have a current AGQS (PFOA, PFOS, PFNA, PFHxS). The emission rates were calculated using the average annual operating hours of the coating towers from 2012 – 2017. Operating hours during that time period were consistent from year to year and reflect the facility's inability to operate the coating towers 24 hrs/day and 356 days/yr.
- Based on annual total precipitation in the Merrimack area of 46 inches/year,[40] NHDES estimated that 21 inches/year (0.53 m/yr) infiltrates the ground in each m^2 area. The maximum deposition rate per year can be used in conjunction with this precipitation infiltration rate per year to conservatively calculate the maximum concentration of each compound which is expected to infiltrate to groundwater using the following formula:

$$Maximum\ Concentration\ of\ PFC\ Infiltrating\ to\ GW\ \left(\frac{\mu g}{m^3} or\ ppt\right) = \frac{Maximum\ Deposition\ Rate\ ((\mu g/m^2)/yr)}{0.53\ (\frac{m}{yr})}$$

Table 11 – PFC Maximum Predicted Deposition Rate Analysis Post RTO Installation

PFC	Emission Rate (lb/yr)	Controlled Emission Rate (lb/yr)[41]	Modeled Annualized Emission Rate (lb/hr)	Modeled Annualized Emission Rate (g/s)	Maximum Deposition Rate[42] (Method 2) ($\mu g/m^2/yr$)	Maximum Concentration of PFC Infiltrating to Groundwater (ppt)	Method Detection Limit for Lab Analysis[43] (ppt)
PFOA	0.74	0.074	8.45E-06	1.06E-06	0.411	0.775	0.79
PFNA	0.19	0.019	2.17E-06	2.73E-07	0.105	0.198	0.25
PFHxS	0.041	0.0041	4.68E-07	5.90E-08	0.0228	0.043	0.16
PFOS	0.045	0.0045	5.14E-07	6.47E-08	0.025	0.047	0.50

- In the May 30, 2019 SGPP air deposition modeling report, Barr referenced the 2018 Barr modeling report in which historical air emissions from SGPP were modeled to predict groundwater impacts from air deposition modeling results. Barr states that based on the methodology presented in that report, the values of maximum deposition rate of each compound listed in Table 11 above would not be likely to result in an exceedance of a current AGQS or MCL.
- Based on the proposed stack parameters and the 90% destruction efficiency of the proposed RTO, the application of the proposed RTO as BACT is not predicted to result in emission of any air contaminant subject to RSA 125-C:10-e to cause or contribute to an exceedance of an AGQS.
- In order to ensure that the maximum concentration of each PFC infiltrating to groundwater remains less than the current maximum detection limit for lab analysis, the maximum annual emission rate for each PFC shall be limited based on the following equation:

40 https://www.bestplaces.net/climate/city/new_hampshire/merrimack
41 For the purpose of the air deposition modeling conducted by Barr, the RTO was assumed to destroy 90% of all PFAS.
42 Maximum Predicted Deposition Scenario (Scenario E: Stack height = 45 ft; Stack diameter = 6 ft; Exhaust temperature = 250°F; Exhaust flow = 53,585 ACFM).
43 The method detection limit (MDL) listed in Table 11 is for the isotope dilution method. Labs using Method 537 will likely have higher detection limits.

$$Maximum\ Annual\ Controlled\ Emission\ Limit\ \left(\frac{lbs}{yr}\right) = MDL\left(ppt\ or\ \frac{\mu g}{m^3}\right) * \frac{IR\ * 60\ \left(\frac{sec}{min}\right) * 60\ \left(\frac{min}{hr}\right) * 8760\ \left(\frac{hrs}{yr}\right)}{1{,}000{,}000\ \left(\frac{\mu g}{g}\right) * UIR * 454\left(\frac{g}{lb}\right)}$$

Where:

MDL = Method Detection Limit for water (ppt) for each PFC [See Table 11]

IR = Annual infiltration rate of precipitation (m/yr) [0.53 m/yr for Merrimack]

UIR = Worse case unit impact rate from the deposition modeling (g/m^2/yr per 1 g/s) [0.386 (g/m^2/yr per g/s) from deposition modeling conducted to date]

The maximum annual controlled PFC emission limits are 0.075 lbs/yr PFOA, 0.048 lbs/yr PFOS, 0.024 lbs/yr PFNA, and 0.015 lbs/yr PFHxS.

DISPERSION MODELING (RTAPs)

- In addition to air deposition modeling, air dispersion modeling was required for HF emissions from the proposed RTO. The purpose of the air dispersion model was to address the requirements of NH Statute RSA 125-C:10-e: *Requirements for Air Emissions of Perfluorinated Compounds Impacting Soil and Water*. Specifically, the statute states in part that "In no event shall application of best available control technology result in emission of any air contaminant that would exceed the emissions allowed by any applicable standard under RSA 125-C or RSA 125-I or rules adopted pursuant to either chapter." Env-A 1400, *Regulated Toxic Air Pollutants* is adopted pursuant to RSA 125-I and sets ambient air limits for inhalation exposure for specific RTAPs.
- There were two air dispersion models conducted for hydrogen fluoride as F for Env-A 1400. NHDES' was summarized in the August 1, 2019 modeling memo. Barr's air dispersion model was summarized in the August 1, 2019 letter from C.T. Male.
- NHDES modeled emissions of HF from the proposed RTO at a rate of 0.228 lb/hr. This emission rate was later revised to 0.24 lb/hr (as described in Table 6) based on the addition of HF emissions currently being emitted and after review of Env-A 1400 where it was determined that the ambient air limits are established for hydrogen fluoride as F.
- The overall results of the NHDES air dispersion modeling is outlined in Table 12. Because there will be only one emission point after the proposed RTO is installed, the maximum predicted impact rate ($\mu g/m^3$) for any RTAP can be calculated from the individual RTAP emission rates (daily and annual) with the following formulas:

  Maximum predicted RTAP impact ($\mu g/m^3$) = RTAP emission rate (lb/hr) x maximum predicted unitized impact ($\mu g/m^3$ per lb/hr)

  Where:

  Maximum predicted unitized 24-hr impact = 5.1754 $\mu g/m^3$ per lb/hr
  Maximum predicted unitized annual impact = 0.6579 $\mu g/m^3$ per lb/hr

Table 12 – Env-A 1400 RTAP Maximum Predicted Concentration Analysis

RTAP	CAS #	Emission Rate (lb/hr)	Maximum Predicted Impact ($\mu g/m^3$)		Ambient Air Limits ($\mu g/m^3$)		Complies with AAL?	
			Annual	24-hr	Annual	24-hr	Annual	24-hr
Hydrogen Fluoride (as F)	7664-39-3	0.24	0.16	1.24	0.98	1.5	Yes	Yes[44]

44 Maximum predicted 24-hr impact is 83% of 24-hr AAL. As noted in the June 20, 2019 NHDES letter to SGPP regarding the EPA ORD analytical results, NHDES believes the quantification of the 89 PFAS compounds that were tentatively identified by EPA ORD in Report #6 is an underestimation of the current PFAS emissions from the facility and by default, an underestimation of the potential HF (as F) emissions from the proposed RTO.

- Barr modeled emissions of HF from the proposed RTO at a rate of 0.0886 lb/hr (See *EMISSION CALCULATIONS/EMISSION STACK TESTING RESULTS* section and Table 6). NHDES is in the process of reviewing the August 1, 2019 Barr modeling. However, the Barr model does not affect the Env-A 1400 compliance determination.
- Based on the NHDES emission rate for hydrogen fluoride (as F) as estimated and the air dispersion modeling conducted by NHDES, the maximum predicted annual and short-term impacts from the emission rate of HF (as F) complies with the Env-A 1400 AALs as shown in Table 12. See *POLLUTION CONTROL EQUIPMENT: HF Scrubber* section above for further discussion on HF emissions, Env-A 1400 compliance and future stack testing requirements.

DISPERSION MODELING (Criteria Pollutants)

No modeling for criteria pollutants is required at this time, because the devices which emit criteria pollutants are below the permitting thresholds of Env-A 607.01. In addition, since facility-wide potential emissions of criteria pollutants are below the thresholds listed in Env-A 606.02(c)(5), the facility a true minor source for CO, NOx, SO_2 and PM_{10}. Therefore, the facility would not need to be included in any interactive modeling for the surrounding area.

COMPLIANCE STATUS

Emission Testing

Historical emission stack testing conducted at the facility has primarily been voluntary or informational other than the required stack test in 2007 as a result of the Administrative Order by Consent ARD 06-006. The AOC required stack testing to be conducted by SGPP on or before April 30, 2007 and test report submitted to NHDES on or before July 31, 2007 for use in determining compliance with Env-A 1400 AALs for ammonium perfluorooctanoate (CAS #3825-26-1). The stack test was conducted April 26, 2007, the report was received by NHDES on July 30, 2007. SGPP submitted a letter to NHDES on July 30, 2007 indicating that air dispersion modeling results predicted a 24-hr impact of 0.021 $\mu g/m^3$ compared to the AAL of 0.050 $\mu g/m^3$ based on average 2007 processing day rates. Heavier processing days were also evaluated and the results were still below the NHDES RTAP 24-hr and annual AALs. NHDES issued a Notice of Compliance for AOC ARD 06-006 on October 31, 2007.

Other previous stack tests have been conducted at the facility on the following dates for the following towers:

Table 13 – Historical Stack Testing Events

Stack Test #	Test Date	Device(s)	Test Description	Documents
16-0038	May 4, 2016	MA Tower	PFOA Testing	Report dated July 2016
16-0075	August 10-11 and October 5, 2016	MA Tower	PFOA Method MM5	Report dated December 2016
18-0040 18-0041 18-0042	April 26 – May 2, 2018	MA, MS and QX Towers	PFOA Method MM5 MA Tower PFOA Method MM5 MS Tower PFOA Method MM5 QX Tower	Report dated September 2018 and revised May 2019

Inspections

The last Full Compliance Evaluation conducted by NHDES, Air Resources Division at the facility was on April 1, 2016. Issues were identified by NHDES and noted below. SGPP responded in a letter dated May 27, 2016 and the responses are also noted below.

1. *Issue noted by NHDES:* Env-A 1400 compliance demonstration used de minimis and adjusted in-stack concentration methods for the antenna cover fabrication area which are not valid approaches based on the design of the exhausts (horizontal).

   SGPP response: A revised Env-A 1400 compliance demonstration using the in-stack concentration method was submitted.

NHDES conclusion: The revised Env-A 1400 compliance demonstration submitted by SGPP on May 27, 2016 demonstrated compliance with Env-A 1400 for the antenna cover fabrication area using the in-stack concentration method for all RTAPs except methyl diphenyl isocyanate (MDI, CAS #101-68-8). On September 30, 2019, C.T. Male submitted information on MDI emissions (See footnote 36) and an air dispersion modeling analysis of remaining RTAP emissions from the antenna cover fabrication area. Since there are RTAPs that overlap between EU17 and the remainder of the devices that will be routed to the RTO, NHDES is in the process of reviewing the air dispersion model using the potential RTAP emission rates listed in Tables 7 and 8 for the entire facility. At this time, it is not anticipated that the review will result in the need for additional permit conditions.

2. *Issue noted by NHDES:* SGPP used coatings with VOC content in excess of the Env-A 1200, VOC RACT limit applicable pre-2016 (2.9 lbs VOC/gallon of coating as applied excluding water and exempt compounds) for the facility. The facility began using a daily bubbling method approach in May, 2015 to demonstrate compliance with VOC RACT after State Permit to Operate SP-0072 was issued with bubbling calculations included. However, SGPP did not have records demonstrating compliance pre-May, 2015. The same issue was identified in the previous inspection report covering 2008 – May 1, 2015.

   SGPP response: Prior to using the bubbling approach, all coatings used at SGPP were evaluated using a two-step process – VOC content from the MSDS and further analysis using Method 24 testing. Only one coating used during the relevant time period did not meet the VOC RACT limit based on step one (data from the MSDS) but later was determined to be below the VOC RACT limit based on step two (Method 24 testing).

   NHDES conclusion: Issue has been resolved.

3. *Issue noted by NHDES:* SGPP was not keeping records of the reason the emergency engine and fire pump had been operated since installation of the emission units in November 2015. A requirement of the permit is to keep track of hours of operation for emergency situations and for maintenance and testing situations as two separate records.

   SGPP response: SGPP created a log to record these hours as a result of the inspection.

   NHDES conclusion: Issue has been resolved.

4. *Issue noted by NHDES:* Previous Env-A 1400 compliance demonstrations for the coating towers assumed operation of stack dilution fans. However, a malfunction with the MS Tower fan resulted in a one-month period of time when the fan was not operational. NHDES requested SGPP conduct an RTAP evaluation for that time period.

   SGPP response: SGPP submitted an Env-A 1400 compliance demonstration for the RTAPs emitted during the malfunction period. The Env-A 1400 compliance demonstration used both de minimis and adjusted in-stack concentration methods but since some RTAPs are common between the coating towers and the antenna cover fabrication area, these methods are not completely correct for this situation. Only the in-stack concentration method or air dispersion modeling reflecting emissions of overlapping RTAPs from both processes is allowed.

   NHDES conclusion: Issue needs further evaluation.

Reports

In the past 5 years, SGPP as submitted NOx and VOC Emission Statements Reports and Annual Emission Reports on time for all years but 2017 (2 days late). The NSPS reporting requirements in Table 5, Item 4 of the current permit have not been triggered to date. Due to past opacity issues, NHDES requested and the facility submitted an Opacity Corrective Action Plan (August 18, 2016 with revisions November 8, 2016).

Fees

The facility is up-to-date with emission based fees.

REVIEW OF REGULATIONS & STATUTE

NH Statute

RSA 125-C:10-e Requirements for Air Emissions of Perfluorinated Compounds Impacting Soil and Water – Applicable (EU01-EU08, EU12, EU13, EU15, EU16 and EU22-EU26) – A device that emits to the air any PFCs or precursors that have caused or contributed to an exceedance of an ambient groundwater quality standard or surface water quality standard as a result of the deposition of any such PFCs or precursors from the air, shall be subject to the determination and application of best available control technology.

State Regulations

Env-A 100 – Organizational Rules

101.671 – Applicable (EU20 & EU21) – Definition of emergency generator.
1302.17 – Applicable (EU20 & EU21) – Definition of emergency as it relates to emergency generator definition.

Env-A 600 – Statewide Permit System

604.02 – Applicable (EU01-EU08, EU12, EU13, EU15-EU17 and EU20-EU22) – The facility is synthetic minor for VOCs and HAPs.
606.02(a)(4) – Applicable (EU01-EU08, EU12, EU13, EU15-EU17 and EU22) – The facility is using air dispersion modeling as the compliance demonstration method specified in Env-A 1405.02.
606.02(b) – Applicable (EU01-EU08, EU12, EU13, EU15-EU16 and EU22-EU26) – The facility is making modifications to the exhaust parameters.
607.01(a) – NOT Applicable – Boiler is < 10 MMBtu/hr combusting #2 fuel oil; burners on towers and other process equipment are each < 10 MMBtu/hr combusting natural gas.
607.01(d)(1) – Applicable (EU20 & EU21) – Fire pump (EU20) and emergency generator engine (EU21) combust liquid fuel (ULSD) and are each > 0.15 MMBtu/hr and total >1.5 MMBtu/hr.
607.01(g) – Applicable (EU01-EU08, EU12, EU13, EU15-EU17 and EU20-EU22) – Total actual VOCs > 10 tpy.
607.01(n) – Applicable (EU01-EU08, EU12, EU13, EU15-EU17 and EU20-EU22) – The facility has taken a 50 tpy VOC limit and a 10/25 tpy HAP limit for synthetic minor status.
607.01(t) – NOT Applicable – Compliance with Env-A 1400 was demonstrated without restrictions. Verification of this compliance status specifically for hydrogen fluoride (CAS #7664-39-3) will be confirmed with stack testing.
607.01(u) – NOT Applicable – The facility is subject to 40 CFR Part 63 subparts. However, these rules do not require a title V permit.
607.01(v) – NOT Applicable – The facility's theoretical potential to emit for NOx is < 50 tpy.
607.01(y) – NOT Applicable – The facility is a synthetic minor HAP source.
609.01 – NOT Applicable – The facility is not any of the source types in Env-A 609.01(a).

Env-A 700 – Permit Fee System – Applicable (EU01-EU08, EU12, EU13, EU15-EU17, EU20-EU26)

705.02 – Applicable – The annual emission fee is comprised of an emission-based fee and a baseline emission fee.
705.05 – Applicable – Payment of the emission fee is due by May 15 of each year.
705.07(a) – Applicable – Each source that emits VOCs or RTAPs that are subject to Env-A 1400 from non-combustion processes shall pay a $750 annual baseline fee for the first VOC or RTAP emission unit, and a $500 annual fee for each additional non-combustion VOC or RTAP emission unit, up to a maximum of 10 non-combustion VOC or RTAP emission units. The facility has 14 VOC emissions units (EU01-EU08, EU12, EU13, EU15, EU16, EU17 & EU22) so the annual baseline emission fee is $5,250.

Env-A 800 – Testing and Monitoring Procedures[45]

802 – Applicable – Compliance stack testing procedures for stationary sources.
804.03 – Applicable – MSDS information for VOC content of coatings.
804.04 – Applicable – Use of Method 24 to determine VOC content of coatings.
EPA Method 24 gives the following:
Volatile matter content, W_s = lbs volatiles/lb coating
Water content, W_w = lbs water/lb coating
Exempt solvents, W_e = lbs exempt solvents/lb coating
Coating density, d = lbs coating/gal coating
Volume of solids, V_s = gal solids/gal coating
From this information, one can calculate weight of VOCs:
$W_{VOC} = W_s – W_w – W_e$ = lbs VOC/lb coating
or wt of solids:
$W_p = 100 – Ws$ = lbs solids/lb coating
and
W_{VOC}/W_P= lb VOC/lb solids
804.05 – Applicable – Calculation of VOC Content of a Coating Formulation
804.06 – Applicable – Calculation of Daily Weighted Average for a Coating Line Using Multiple Coatings
804.07 – Applicable – Calculation of Emission Standard for Sources Complying with VOC RACT Using Either a Bubble or Add-On Controls (same as Env-A 1205.01)
804.08 – Applicable – Calculation of Daily-Weighted Average for Coating Lines with Bubble or Control Device
804.09 – Applicable – Calculation of Required Overall Emission Reduction Efficiency of a Control System[46]
804.10 – Applicable – Calculation of Actual Overall Emission Reduction Efficiency of a Control System
804.11 – Applicable – Compliance Determination of a Control System
804.12 – Applicable – Initial Compliance Stack Testing for VOCs
804.13 – Applicable – Periodic Compliance Stack Testing for VOCs
804.14 – Applicable – Test Methods for Compliance Stack Testing for VOCs
805 – Applicable – The facility must demonstrate capture efficiency of the devices exhausted to the RTO.
810 – Applicable – Monitoring Plans for Air Pollution Control Equipment

Env-A 900, Owner or Operator Recordkeeping and Reporting Obligations

902 – Applicable – Availability of records.
903 – Applicable – General recordkeeping requirements.
904 – Applicable – VOC Emission Statements recordkeeping requirements.
905 – Applicable – NOx Emission Statements recordkeeping requirements.
906 – Applicable – Additional recordkeeping requirements.
907 – Applicable – General reporting requirements.
908 – Applicable – VOC Emission Statements reporting requirements.
909 – Applicable – NOx Emission Statements reporting requirements.
910 – Applicable – Additional reporting requirements.
911.02(b) – Applicable – Additional recordkeeping and reporting specific to non-title V sources.

Env- A 1200 – Volatile Organic Compounds (VOCs) Reasonable Available Control Technology (RACT) – Applicable (EU01-EU08, EU12, EU13, EU15-EU17)

1202.21 – "Bubble" means a technique of aggregating certain emissions so as to impose controls

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45 SGPP has requested that all options available to coating facilities be afforded to them for VOC RACT compliance. Therefore, SGPP can buy or formulate compliant coatings using Method 24 to demonstrate compliance, OR SGPP can bubble the VOC content (lb/lb) of multiple coatings and calculate a daily weighted average to demonstrate compliance, OR SGPP can use the control efficiency determined during stack testing of the RTO for those coating lines tied to the RTO along with daily uncontrolled emissions from EU17 to demonstrate compliance.

46 Env-A 804.05 through 804.09 refer to the standards in Env-A 1200 in terms of lbs VOC/gal of coating. However, since 2016, SGPP has been required to meet lb VOC/lb solids or lb VOC/lb coating standards. Therefore, these calculations shall be converted accordingly.

that are more stringent than RACT-level on certain emissions units at a particular source, while simultaneously imposing controls that are less stringent than RACT-level on other emissions units, including the option of no controls on such units.
1205.02(a) – Applicable – Compliance with emission limits [e.g. Env-A 1207] can be achieved through implementation of add-on control techniques or bubble
1205.07 – Applicable – A source subject to this chapter shall comply with the applicable testing requirements as listed for each source category pursuant to Env-A 804. When compliance with the applicable emission standards is achieved by using a capture and control system, a capture efficiency test shall be performed according to the procedures in Env-A 805.
1207, *Paper, fabric, film and foil substrates coating* – Applicable – The facility is subject to the requirements of Env-A 1207 because the combined actual VOC emissions are greater than 3 tons per consecutive 12-month period.
1207.02 – Applicable – work practice standards
1207.03(c) – Applicable – TPE >25 tpy; emission limits [0.40 lb VOC/lb solids or 0.08 lb VOC/lb coating] or control efficiency [90%]
1220, *Miscellaneous Industrial Adhesives* – NOT Applicable – The facility is not subject to the requirements of Env-A 1220 because sources who use industrial adhesives associated with fabric coating are exempt pursuant to Env-A1220.01(b).
1222, *Miscellaneous and Multicategory Stationary VOC Sources* – NOT Applicable – The facility is not subject to the requirements of Env-A 1222 because the combined theoretical potential emissions of VOCs from the facility is limited by permit conditions to less than 50 tpy.

Env-A 1300 – Nitrogen Oxide (NOx) Reasonable Available Control Technology (RACT) – NOT Applicable

1301.03 – The facility has either had theoretical potential emissions less than 50 tons during any consecutive 12-month period or a permit limit which exempts the source from Env-A 1300.

Env-A 1400 - Regulated Toxic Air Pollutants

The facility is able to show compliance using uncontrolled, potential emissions. (See Table 14 below)

Env-A 1600 – Fuel Specifications

1602.01 – Applicable to small boiler that is not above the permitting threshold – #2 fuel oil is a listed fuel
1603.03(a) – Applicable – #2 fuel oil sulfur limit of 0.0015% by weight – requirement doesn't need to be included in the permit since this fuel sulfur limit applies to all #2 fuel oil imported and distributed in the state of NH

Env-A 2000 – Fuel Burning Devices

2001.02 – Applicable – any stationary fuel burning device that is a source of particulate matter or visible emissions
2002.02 – Applicable (EU20, EU21 & PCE01) – all fuel burning devices at facility were installed after May 13, 1970; opacity limit (< 20%)
2003.03 – Applicable (EU20, EU21 & PCE01) – particulate matter emission limitation (0.30 lb/MMBtu)

Env-A 2100 – Particulate Matter and Visible Emissions Standards
2101, 2102 and 2103 – Applicable – any stationary device not specifically regulated pursuant to any other chapter, part, or section of the air regulations that operates in NH and is a source of particulate matter discharged to the ambient air through a stack or through an exhaust and ventilation system or any device that is a source of visible emissions
2103.02 – Applicable – opacity limit (<20%)

Federal Regulations

40 CFR Part 60 – New Source Performance Standards

Subpart Dc – Industrial-Commercial-Institutional Steam Generating Units

§60.40c – NOT Applicable – Boiler < 10MMBtu/hr

Subpart VVV – Polymeric Coating of Supporting Substrates

§60.740 – Applicable – (EU01-EU08, EU12, EU13, EU15 & EU16) – Affected facility is each coating operation and any onsite coating mix preparation equipment used to prepare coatings for the polymeric coating of supporting substrates. Any affected facility for which the amount of VOC used is less than 95 Mg per 12-month period is subject only to the requirements of §§60.744(b), 60.747(b), and 60.747(c). This subpart applies to any affected facility for which construction, modification, or reconstruction begins after April 30, 1987, except for coating mix preparation equipment or coating operations during those times they are used to prepare or apply waterborne coatings so long as the VOC content of the coating does not exceed 9% by wt of the volatile fraction.

§60.744(b) – Each owner or operator of an affected facility that uses less than 95 Mg of VOC per year shall make semiannual estimates of the projected annual amount of VOC to be used for the manufacture of polymeric coated substrate at the affected coating operation in that year and maintain records of actual VOC use.

§60.747(b) – Applies only to the first year of operation.

§60.747(c) – Each owner or operator of an affected facility initially using less than 95 Mg of VOC per year shall:

(1) Record semiannual estimates of projected VOC use and actual 12-month VOC use;
(2) Report the first semiannual estimate in which projected annual VOC use exceeds the applicable cutoff; and
(3) Report the first 12-month period in which the actual VOC use exceeds the applicable cutoff.

Subpart IIII – Stationary Compression Ignition Internal Combustion Engines

§60.4200(a) – Applicable – EU20 Clarke fire pump manufactured after July 1, 2006; EU21 Kohler emergency generator set manufactured after April 1, 2006

§60.4202(a)(2) – Applicable (EU21)

§60.4202(d) – Applicable (EU20)

40 CFR Part 61 – National Emissions Standards for Hazardous Air Pollutants – No applicable subparts

40 CFR Part 63 – National Emissions Standards for Hazardous Air Pollutants at Stationary Sources

Subpart JJJJ – Paper and Other Web Coating

§63.3290 – NOT Applicable – Facility is a synthetic minor HAP source

Subpart OOOO – Printing, Coating and Dyeing of Fabrics and Other Textiles

§63.4281(b) – NOT Applicable – Facility is a synthetic minor HAP source

Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines

§63.6585 – NOT Applicable – EU18 and EU19 were decommissioned in 2015

Subpart DDDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters

§63.7485 – NOT Applicable – Facility is a synthetic minor HAP source

Subpart HHHHHH – Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources

§63.11170 – NOT Applicable – Facility does not spray coat metal or plastic parts

Subpart JJJJJJ – Industrial, Commercial and Institutional Boilers at Area Sources

§63.11193 – Applicable – Boiler is located at an area HAP source – initial notification received 08/29/2011

Table 14 – Facility-wide Env-A 1400 Compliance Determination						
RTAP	**CAS #**	**Devices from which the RTAP is Emitted**	**Vertical and Unobstructed? Y/N**	**Emission Rate**		**Compliance Determination Method**
				Annual (lbs/yr)	**24-Hr (lbs/day)**	
Ethyl Acetate	141-78-6	Antenna	N	52.4	0.14	Air Dispersion Modeling
Xylene	1330-20-7	Antenna	N	6.6	0.02	Air Dispersion Modeling
Ethyl Benzene	100-41-4	Antenna	N	1.3	0.004	Air Dispersion Modeling
Ethylene Glycol	107-21-1	Coaters	Y	8,208	22.49	Air Dispersion Modeling
Toluene	108-88-3	Both	N	7,214.8	19.77	Air Dispersion Modeling
Isopropanol	67-63-0	Coaters	Y	292.2	0.80	Air Dispersion Modeling
Ethanol	64-17-5	Coaters	Y	7.72	0.02	Air Dispersion Modeling
1,4-Dioxane	123-91-1	Coaters	Y	14.69	0.04	Air Dispersion Modeling
Benzene	71-43-2	Both	N	0.196	0.00054	Air Dispersion Modeling
Polyethylene Glycol	25322-68-3	Coaters	Y	1,593	4.36	Air Dispersion Modeling
Tetrafluoroethylene	116-14-3	Coaters	Y	2,642	7.24	Air Dispersion Modeling
Methanol	67-56-1	Coaters	Y	130.39	0.36	Air Dispersion Modeling
Methyl Ethyl Ketone	78-93-3	Both	N	1,181.2	3.24	Air Dispersion Modeling
n-Methyl-2-pyrrolidone	872-50-4	Coaters	Y	124.43	0.34	Air Dispersion Modeling
Hexane	110-54-3	Both	N	140.12	0.38	Air Dispersion Modeling
PFOA (as Ammonium Perfluorooctanoate)	3825-26-1	Coaters	Y	2.0	0.005	Air Dispersion Modeling
Hydrogen Fluoride (as F)	7664-39-3	Coaters/ RTO	Y	2,278	6.24	Air Dispersion Modeling
Ammonia	7664-41-7	Coaters	Y	723	1.98	Air Dispersion Modeling