Savannah River
NUCLEAR SOLUTIONS
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(PW)

October 14, 2021

SRNS-J2200-2021-00320
RSM Track #: 10818

Air Permitting Division Director
Bureau of Air Quality
South Carolina Department of Health and
Environmental Control
2600 Bull Street
Columbia, SC 29201

RECEIVED
OCT 20 2021
BAQ PERMITTING

Dear Director:

SAVANNAH RIVER SITE (SRS) CONSTRUCTION PERMIT APPLICATION - MODIFICATION TO CHEMICAL FLOWSHEET PROCESS ASSOCIATED WITH EMISSION UNIT 16 TV-0080-0041 DEFENSE WASTE PROCESSING FACILITY VITRIFICATION PROCESS

The mission of the Defense Waste Processing Facility (DWPF) is to vitrify High-Level Liquid Radioactive Waste (HLW). The proposed modification will replace formic acid with glycolic acid in the chemical flowsheet.

This package includes one permit application (DHEC 2566 and 2573 forms with associated documentation) with original signatures and professional engineer embossment/stamp. An electronic copy of this application with modeling files will also be transmitted to Robert Mahoney via email distribution and airpermitting@dhec.sc.gov.

Please contact me at (803) 952-6853 if you have any questions concerning this request.

Sincerely,

Kim A. Wolfe
Environmental Compliance

Enclosures

c: R. K. Mahoney, SCDHEC – Columbia (electronic with modeling files)
T. R. Fuss, SCDHEC - Aiken (electronic)
G. N. O'Quinn, SCDHEC – Aiken (electronic)
P. A. Risa, SCDHEC - Aiken (electronic)
J. G. DeMass, DOE-SR, 730-B
A. G. Hammett, 730-B
J. T. Maul, Jr., 704-S
M. N. Ndingwan, 730-B
C. L. Bergren, SRNS, 730-4B
A. J. Meyer, 730-4B
C. J. Ward, 730-4B
K. A. Wolfe, 730-4B
A. R. Waller, 730-4B
J. R. Wicker, 730-4B
M. C. Wright, 703-47A
R. J. Biasiny, 703-47A
P. J. Breidenbach, SRR, 766-H
M. A. Schmitz, 766-H
L. Ling, 766-H
G. J. Matis, 766-H
P. M. Allen, 766-H
T. H. Huff, 704-S
M. A. Rios-Armstrong, 704-S
J. S. Kirk, 766-H
D. P. Skiff, 766-H
P. J. Rowan, 704-S
K. R. Liner, 704-S
T. B. Caldwell, 766-H
P. B. Underwood, 705-1C
Records Administration, 773-52A

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SECTION 1 - FACILITY IDENTIFICATION

SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Application Date October 14, 2021
Facility Name/Legal Identity *(This should be the official legal name under which the facility is owned/operated and should be consistent with the name registered with the S.C. Secretary of State's office, as applicable.)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC; Liquid Waste Operations currently operated by Savannah River Remediation, LLC	
Facility Site Name (Optional) *(Please provide any alternative or additional identifier of the facility, such as a specific plant identifier (e.g., Columbia plant) or any applicable "doing business as" (DBA) identity. This name will be listed on the permit and used to identify the facility at the physical address listed below.)* Defense Waste Processing Facility (DWPF)	
Facility Federal Tax Identification Number *(Established by the U.S. Internal Revenue Service to identify a business entity)* 26-3972730	

REQUEST TYPE (Check all that apply)
Exemption Request: ☐ Complete Section 1 and attach documentation to support exemption request.
Construction Application: ☒ Minor New Source Review Project ☐ Synthetic Minor Project ☐ Prevention of Significant Deterioration Project ☐ 112(g) Project
Expedited Review Request: ☐ If checked, include Expedited Form D-2212 in the construction application package.
Construction Permit Modification: ☐ Provide the construction permit ID (e.g. CA, CB, etc.) for which modification is requested:
Application Revision: ☐

CONSTRUCTION PERMIT APPLICATION FORMS BEING REVISED *(Amended construction permit forms must be filled out completely and attached to this modification request.)*		
Form #	**Date of Original Submittal**	**Brief Description of Revision**
D-2566		
D-2573		

FACILITY PHYSICAL ADDRESS		
Physical Address: Savannah River Site (SRS)		County: Aiken (also Barnwell and Allendale)
City: Aiken	State: SC	Zip Code: 29808-0001

FACILITY PHYSICAL ADDRESS	
Facility Coordinates *(Facility coordinates should be based at the front door or main entrance of the facility)*	
Latitude: 431063.4205192	Longitude: 3689656.543319

FACILITY'S PRODUCTS / SERVICES	
Primary Products / Services *(List the primary product and/or service)* Processed Fissile Material and High Level Liquid Radioactive Waste Vitrification	
Primary SIC Code *(Standard Industrial Classification Codes)* 4953	Primary NAICS Code *(North American Industry Classification System)* 562211
Other Products / Services *(List other products and/or services)* Environmental Remediation	
Other SIC Code(s):	Other NAICS Code(s): N/A

PROJECT DESCRIPTION
Project Description (What, why, how, etc.): See Attachment A

AIR PERMIT FACILITY CONTACT *(Person listed will be in our files as the point of contact for all air permitting related questions and will receive all air permitting notifications.)*			
Title/Position: Air Program Lead, Environmental Compliance - SRNS, LLC	Salutation: Ms.	First Name: Kim	Last Name: Wolfe
Mailing Address: Savannah River Site 730-4B, Room 3051			
City: Aiken		State: SC	Zip Code: 29808-0001
E-mail Address: kim.wolfe@srs.gov		Primary Phone No.: (803) 952-6853	Alternate Phone No.: (803) 507-2066

The signed permit will be e-mailed to the designated Air Permit Contact.
If additional individuals need copies of the permit, please provide their names and e-mail addresses.

Name	E-mail Address
Adam Waller	adam.waller@srs.gov
Paul Rowan	paul.rowan@srs.gov

CONFIDENTIAL INFORMATION / DATA
Is confidential information or data being submitted under separate cover? ☒ No ☐ Yes*

If yes, submit* ***ONLY ONE COMPLETE CONFIDENTIAL APPLICATION*, *with original signature, along with the public version of the application.*

CO-LOCATION DETERMINATION
Are there other facilities in close proximity that could be considered collocated? ☐ No ☒ Yes*
If yes, list potential collocated facilities, including air permit numbers if applicable: See Attachment B

**If yes, please submit collocation applicability determination details in an attachment to this application.*

OWNER OR OPERATOR			
Title/Position: Director - ESH&QA&CA	Salutation: Ms.	First Name: Patricia	Last Name: Allen
Mailing Address: Savannah River Site, Building 766-H, Room 2308			
City: Aiken		State: SC	Zip Code: 29808
E-mail Address: patricia.allen@srs.gov		Primary Phone No.: (803) 208-3152	Alternate Phone No.: (803) 646-9043
OWNER OR OPERATOR SIGNATURE			
I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, supporting documentation, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.			

Patricia M. Allen — 10/13/21

Signature of Owner or Operator — Date

APPLICATION PREPARER (if other than Professional Engineer below)			
Title/Position: Principal Engineer/ECA	Salutation: Mr.	First Name: Paul	Last Name: Rowan
Mailing Address: Savannah River Site, Building 704-S			
City: Aiken		State: SC	Zip Code: 29808-0001
E-mail Address: paul.rowan@srs.gov		Phone No.: (803) 208-6470	Cell No.: (803) 507-4213

PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name: Savannah River Remediation LLC	SC Certificate of Authority License No.: 3997		
Title/Position: Principal Engineer	Salutation: Mr.	First Name: Thomas	Last Name: Caldwell
Mailing Address: Savannah River Site, Building 766-H, Room 2423			
City: Aiken		State: SC	Zip Code: 29808
E-mail Address: thomas.caldwell@srs.gov		Phone No.: (803) 208-3145	Cell No.: (803) 979-3209
SC License/Registration No.: 14164			
PROFESSIONAL ENGINEER SIGNATURE			
I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*			

Th B Caldwell — 10/13/2021

Signature of Professional Engineer — Date

Thomas B. Caldwell PE – SC License No. 14164
Savannah River Remediation LLC – SC COA No. 3997

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 14164 THOMAS B. CALDWELL 10/13/2021

SOUTH CAROLINA SAVANNAH RIVER REMEDIATION LLC No. 3997 CERTIFICATE OF AUTHORIZATION

SECTION 2- EQUIPMENT / PROCESS INFORMATION INSTRUCTIONS

The information provided in tables in this section will identify the equipment and processes that will be added, removed or modified at the facility, including the size and type along with the make and model, and any associated control devices and/or emission points.

As an attachment to this form include a narrative with the following information:

- Description of the facility's proposed new or altered processes;
- Physical and chemical properties and feed rate(s) of the raw materials used and products made from which the facility determined potential emissions;
- Process flow diagram / production process layout of all new or altered sources changed showing the flow of materials and intermediate and final products.

Equipment / Process Information Table:
Please identify the equipment and processes that are being added, removed, modified, or are existing and provide the information requested in this table. Additional information required to complete the review of this permit application should be submitted as attachments.

Control Device Information Table:
Identify the control devices being added, removed, modified, or existing in the proposed construction project and provide the information requested in this table. Additional information required to complete the review of this permit application should be submitted as attachments.

EQUIPMENT / PROCESS INFORMATION
Be as detailed as possible when filling out "Equipment/Process Description." The following includes examples of source types and relevant information associated with that source: ***External Combustion Sources:*** Equipment type and usage (e.g. steam generation, process heat, drying, curing, etc.), maximum heat capacity (MMBTU/hr), primary and backup fuel type (e.g. natural gas, fuel oil, coal, etc.), fuel sulfur content, Low NO_x burners, direct or indirect heating ***Stationary Internal Combustion Sources:*** Equipment type and usage (e.g. emergency generator, fire pump, etc.), output brake/electrical power (hp/kW), fuel type ***Liquid Storage Tanks***: Tank type (e.g. fixed roof, floating roof, variable vapor pressure, etc.), materials stored, material density, vapor pressure, maximum average storage temperature, loading source (e.g. pipeline, rail car, process, etc.) ***Incinerators***: Incinerator type (e.g. rotary kiln, air curtain, single chamber, etc.), primary and secondary waste types (e.g. municipal waste, yard waste, clean wood, etc.), waste charge rate (tons/day or lb/hr), burner capacity (BTU/hr), minimum chamber temperature ***Surface Coating Sources***: Coating operation type (e.g. large appliances, auto and light duty trucks, paper and other webs, publication printing inks, etc.), transfer efficiency, coating density, percent Volatile Organic Compound (VOC)/Hazardous Air Pollutants (HAPs)/Toxic Air Pollutants (TAPs), Safety Data Sheets (SDS) Please review applicable regulations to determine additional information that may be required for permitting.

EQUIPMENT / PROCESS INFORMATION					
Equipment ID/ Process ID	Action	Equipment / Process Description	Maximum Design Capacity (Units)	Control Device ID(s)	Emission Point ID(s)
	☐ Add ☐ Remove ☐ Modify ☐ Existing	See attached equipment/process information spreadsheet (Attachment C)			
	☐ Add ☐ Remove ☐ Modify ☐ Existing	See attached emission point pre and post modification flowsheets (Attachment D)			
	☐ Add ☐ Remove ☐ Modify ☐ Existing				

CONTROL DEVICE INFORMATION

Inherent, required and voluntary control devices, as used in the table below, are defined as:

Inherent: Consult EPA Guidance "Criteria for Determining Whether Equipment is Air Pollution Control Equipment or Process Equipment." When a control device is deemd "Inherent", a detailed explanation of the determination must be included as an attachment.

Required: Control device is relied-upon or required by regulation, and controlled emissions are used to show compliance with applicable standards and regulations.

Voluntary: Control device is not relied-upon and uncontrolled emissions are used to show compliance with applicable standards and regulations.

CONTROL DEVICE INFORMATION								
Control Device ID	**Action**	**Control Device Description**	**Maximum Design Capacity (Units)**	**Inherent/ Required/ Voluntary**	**Pollutants Controlled** (Include CAS #)	**Capture Efficiency**	**Destruction/ Removal Efficiency**	**Emission Point ID(s)**
CD-J 0005	☐ Add ☐ Remove ☒ Modify ☐ Existing	Condenser - Mitternight Boiler Works, 31-60 - No physical change to control device due to process modification. However, Formic Acid will no longer be listed as a pollutant it condenses, since the process has moved to the use of glycolic acid. Mercury will continue to be removed by this condenser. However, maximum potential to emit emissions of mercury and mercury compounds are less than 1% by weight of the emission stream and these pollutants are not OSHA carcinogens. Therefore, condenser is considered voluntary.	Normal flow of 2530 lb/hr at an inlet temperature of 50C and exit temperature of 10C (ESH-ECS-2002-00284, attached)	Voluntary	Mercury (Elemental) [CAS# 7439-97-6]	100%	96%	SDP007
	☐ Add ☐ Remove ☐ Modify ☐ Existing							
	☐ Add ☐ Remove ☐ Modify ☐ Existing							

SECTION 3 – SOURCE IDENTIFICATION AND EMISSIONS CHECKLIST INSTRUCTIONS

Definitions for completing the information in the tables below:

Uncontrolled emissions: Maximum emission rate at full design capacity without consideration of control devices or emission limitations.

Controlled emissions: Maximum emission rate at full design capacity taking into consideration control devices. Controlled emissions only apply if there are associated control equipment and should be based on uncontrolled emissions and capture/control efficiencies. Controlled emissions do not take into consideration emission limitations.

Potential to Emit (PTE): The maximum capacity of a source to emit a regulated pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a regulated pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design only if the limitation or the effect it would haveon emissions is federally enforceable. Secondary emissions as defined in S.C. Regulation 61-62.1, Section I(81), do not count in determining the potential to emit of a source.

Check Box for information addressed	Required Information
Source identification and emissions:	
☒	• Name of each source, process, and control device.
☒	• Assign each source an Equipment ID. The IDs must match the IDs listed in Section 2 of this application.
☒	• Assign an Emission Point ID for each source.
☒	• Assign a Control Device ID for each control device.
☒	• List each pollutant the source will emit.
☒	• List the Uncontrolled, Controlled, and PTE emissions for each source or equipment in lb/hr and tons/year.
☒	• Emission rates for each pollutant should be totaled and listed in lb/hr and tons/year.
☒	• Provide the CAS# for each Hazardous Air Pollutant (HAP) and/or Toxic Air Pollutant (TAP).
Information to support emission rates:	
☒	• Sample calculations.
☐	• Emission factors. Include the source, revision date, specific table and/or chapters. Include source test data if factors were derived from source testing.
☒	• Explanation of assumptions, bottlenecks, etc.
☐	• Source test information: A copy of the source test results may be requested. If the test results are not included in the application, the application should cite whether this was a DHEC approved test, and if not, explain where the test was conducted and other identifying information.

Check Box for information addressed	Required Information
☐	• Manufacturer's data.
☐	• Vendor guarantees that support control device efficiencies.
☒	• New Source Review (NSR) analysis.
☐	• Other (e.g. example particle size analysis)

Existing (Permitted) Facilities		
Check Box	**Required Information**	**Location in Application**
☒	Facility-wide emissions prior to construction/modification: • Include an explanation if these emissions do not match the facility-wide emissions submitted in the last application.	Attachment G
☐	Facility-wide emissions after construction/modification: • Include net change, if applicable.	Attachment G
As applicable for the construction/ modification:		
☒	• Name of each source.	Attachments A and C
☒	• Assign each source an Equipment ID. The IDs must match the IDs listed in Section 2 of this application or on your current construction / operating permit.	Attachment C
☒	• Assign a Control Device ID for each control device.	Attachment C
☒	• Assign an Emission Point ID for each source.	Attachment C
☒	• List each pollutant the source will emit.	Attachment A
☒	• List the Uncontrolled, Controlled, and PTE (if applicable) emissions for each source or equipment.	Attachments E and F
☒	• Emission rates for each pollutant should be totaled and listed in lb/hr and tons/year.	Attachment F
☒	• Provide the CAS# for each HAP and/or TAP.	Attachments C, E, and F
Information to support facility-wide emission rates:		
☒	• Sample calculations.	Q-ESR-S-00002, Attachment H, and SRR-ESH-2019-00240
☐	• Emission factors. Include the source, revision date, specific table and/or chapters. Include source test data if factors were derived from source testing.	
☒	• Explanation of assumptions, bottlenecks, etc.	Attachment H

Existing (Permitted) Facilities		
Check Box	**Required Information**	**Location in Application**
☐	• Source test information: A copy of source the test results may be requested. If the results are not included in the application, the application should cite whether this was a DHEC approved test and if not, explain where the test was conducted and other identifying information.	
☐	• Manufacturer's data.	
☐	• Vendor guarantees that support control device efficiencies.	
☒	• NSR analysis.	Attachment I
☐	• Other (please explain)	

Section 4 Completeness Checklist for Regulatory Review

State and Federal Air Pollution Control Regulations and Standards

Perform a review of all State and Federal Air Pollution Control Regulations and Standards for applicability and attach a detailed narrative from the regulatory review to the permit application. If the standard or regulation is not applicable, state the reason. Check all regulations and standards that have been reviewed and addressed in the narrative.

Check Box	State and Federal Air Pollution Control Regulations and Standards
☒	S.C. Regulation 61-62.1 Section II.E Synthetic Minor Construction Permits
☒	S.C. Regulation 61-62.5 Air Pollution Control Standards
☒	• Standard No. 1 Emissions from Fuel Combustion
☒	• Standard No. 2 Ambient Air Quality
☒	• Standard No. 3 Waste Combustion and Reduction (state only)
☒	• Standard No. 4 Emissions from Process Industries *(Note: If Section VIII of this Standard applies, include the process weight rate (PWR) in ton per hour for each applicable source or process.)*
☒	• Standard No. 5 Volatile Organic Compounds
☒	• Standard No. 5.2 Nitrogen Oxides Lowest Achievable Emission Rate
☒	• Standard No. 7 Prevention of Significant Deterioration (PSD)
☒	• Standard No. 7.1 Nonattainment New Source Review (NSR)
☒	• Standard No. 8 Toxic Air Pollutants (TAPs) (state only)
☒	S.C. Regulation 61-62.6 Control of Fugitive Particulate Matter
☒	S.C. Regulation 61-62.60 and 40 CFR Part 60 New Source Performance Standards (NSPS)
☒	S.C. Regulation 61-62.61 and 40 CFR Part 61 National Emission Standards for Hazardous Air Pollutants (NESHAP)
☒	S.C. Regulation 61-62.63 and 40 CFR Part 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories
☒	40 CFR Part 64 Compliance Assurance Monitoring (CAM)
☒	S.C. Regulation 61-62.68 and 40 CFR Part 68 Chemical Accident Prevention Provisions
☒	S.C. Regulation 61-62.70 and 40 CFR Part 70 Title V Operating Program
☐	Other S.C. Air Pollution Control Regulations, as applicable.
☐	Other Federal Air Pollution Control Regulations, as applicable.
☒	40 CFR 98 Green House Gas (GHG) emissions *(Note: Quantify GHG emissions, if S.C. Regulation 61-62.5, Standard No. 7 or S.C. Regulation 61-62.5, Standard No. 7.1 is triggered.)*

Completeness Checklist:
For applicable federal and state regulations, the narrative should address the specific limitations, monitoring, recordkeeping, and reporting requirements associated with the new or altered source(s). Include the specific regulatory citations. Check all that have been reviewed and addressed in the narrative.

Check Box	Completeness Checklist:
	Applicability Determination:
☒	• Is this regulation *applicable, reasonably applicable, potentially applicable,* or *not applicable?*
☒	• Is the basis for the applicability determination explained?
	Affected Sources:
☒	• Is the name and identification of each emission source or process included?
	Compliance Demonstration:
☒	• How will compliance be demonstrated?
☒	• Are specific methods or activities to be utilized by the facility to demonstrate compliance with each specific limitation and/or requirement provided?
☒	• Are control devices and control device requirements included?
☒	• Are monitoring, recordkeeping, and reporting requirements necessary to demonstrate compliance included?
	Regulatory Citations:
☒	• Are the regulatory citations identified?

DHEC Form 2566 - Project Description - Attachment A

The mission of the Defense Waste Processing Facility (DWPF) is to vitrify High-Level Radioactive Waste (HLW). This is achieved by mixing the HLW with silica sand, melting the mixture, and pouring the glass mixture into stainless steel canisters, which are stored temporarily on-site, pending final disposition.

The proposed activity will involve a change in DWPF Building 221-S Chemical Process Cell (CPC) operations that affect the SDP0007 emission point, as well as the SDP0009, SDP0019, SDP0067, SDT0035, SDT0036, SDT0043, SDT0046, and SDT0047. SDP0067 (raw material storage), SDT0035 (waste/chemical treatment), SDT0036 (waste/chemical treatment), SDT0043 (raw material storage), SDT0046 (raw material storage), and SDT0047 (raw material storage) are not part of the vitrification process but, that have been listed on the Title V Operating permit as insignificant for emission levels.

The DWPF will remain a batch process as described in previous maximum potential to emit calculations (e.g., SRNS-J2200-2019-00240) and the calculations attached to this construction permit application (Attachment H and Q-ESR-S-00002)). The change from formic acid to glycolic acid will not remove any bottlenecks within the process and will not result in an increase in the annual maximum quantity of glass that can be produced at the facility.

The current DWPF CPC operation uses nitric acid to neutralize HLW resulting in the destruction of hydroxides and carbonates. The neutralization step is followed by the addition of formic acid (reductant) to reduce mercury into elemental mercury. The reductant converts mercury compounds—a carryover from the Separations process—in the raw sludge to its metal state thus allowing the metal to be steam stripped out of the feed stream before entering the Melter. The current nitric-formic acid flowsheet uses formic acid as the reductant; the proposed nitric-glycolic acid flowsheet uses glycolic acid. Glycolic acid is more effective at reducing mercury while minimizing hydrogen gas generation as compared to formic acid.

The DWPF process will be converted to a glycolic acid flowsheet from the current formic acid flowsheet. The glycolic acid operation will utilize existing DWPF process equipment with minor modification to provide a significant process improvement to the CPC. With the change to the glycolic acid flowsheet, the reference to and use of formic acid in the CPC will be replaced with glycolic acid. The existing formic acid storage and transfer equipment will be relabeled and used to store and transfer glycolic acid.

The emission points (SDP0007, SDP0009, SDP0019, SDT0035, SDT0036, SDT0043, and SDT0046) emitting formic acid prior to the proposed change will no longer emit formic acid after implementation of the glycolic acid flowsheet. SCDHEC ID 103S [SDP0009], SCDHEC IDs 131S, 132S and 129S [SDP0019], SCDHEC ID 288S [SDP0067], SCDHEC ID 374S [SDT0046] and SCDHEC ID 407S [SDT0047] will be abandoned in place as part of this modification. The nitric acid emissions from SDP0067 (only regulated pollutant emitted) will be slightly increased by this modification. The vapor pressure of glycolic acid is very low. This results in no regulated pollutants being emitted from SDT0035, SDT0036, and SDT0043. Future HLW streams processed in DWPF after the glycolic acid flowsheet is implemented could have higher radionuclide concentrations, but the future waste feed concentrations as it pertains to nitrogen- and carbon-based pollutants should not exceed the values calculated to support those incorporated in this permit application as they were determined to be the worst-case scenario for the glycolic acid-based reductant process.

Form 2566 – Collocation Determination – Attachment B

Facility	Air Permit Numbers	Proximity	Ownership/Common Control	Additional Information
Ameresco Biomass Cogeneration Facility (including K-Area and L-Area biomass boilers)	0080-0144	Located within boundaries of SRS	Property is Owned by the Department of Energy (DOE)	Steam generated at Ameresco facilities support SRS facilities.
Salt Waste Processing Facility (SWPF)	NA-Exempted via condition 7.B.3 of SRS's original Title V Operating permit	Located within boundaries of SRS	Property is Owned by the Department of Energy (DOE)	The purpose of SWPF is to process streams from other SRS facilities. This is a support facility.
Research and Development (R&D) Activities performed at leased facilities within the Savannah River Research Campus maintained by Aiken County and at facilities located on SRS	NA-R&D activities are exempt from construction and operating permitting	In 2013 a determination was made that even though the research campus facilities are not within the SRS boundary they were collocated (SRNS-J2000-2013-00248). The current guidance states, "[The collocation guidance] is intended to be a guide and not an exhaustive list of all possible scenarios. These determinations are made on a case-by-case basis regarding the existing situation at specific facilities."	Personnel performing R&D activities at the Aiken country facilities and on the SRS site are under common control and share the major industrial grouping 87. Research performed at these laboratories support the work at SRS.	On 4/1/2021 a meeting was held with SCDHEC personnel on transition of SRNL to Battelle Savannah River Alliance, LLC (BSRA). Collocation with respect to air permitting was discussed and it was determined SRNL activities would remain collocated with SRS activities.
Three Rivers Solid Waste Authority Regional Landfill (Landfill)	0080-0112	The Landfill is within the SRS site boundary, but a fence separates the Landfill from the remainder of SRS. Public access to the Landfill is not allowed, but access is provided to member counties and approved commercial haulers. (http://www.trswa.org/landfill.shtml)	• Landfill does not share a common workforce with SRS. • Landfill is responsible for its own equipment, property, and pollution control devices. • Landfill personnel do not share common employee benefits, health plans, retirement funds and other administrative functions • The Landfill does accept waste from the SRS. However, SRS contributes only 1.3% of the total waste received (http://www.trswa.org/landfill.shtml) SRS could transport their waste to another permitted facility with little or no impacts to the Landfill or SRS. • Landfill personnel are responsible for compliance with air quality control requirements at the Landfill. The DOE is not listed on the air permit for the Landfill. • Easement has been provided to the Landfill for the use of the property. The Landfill does receive waste from the SRS. These are not agreements that impact control and operation of the Landfill.	The Landfill and SRS are not within the same industrial grouping. The Landfill is not a support facility for SRS since the SRS contributes far less than 50% of the waste being disposed at the Landfill and does not have operational control over the Landfill. **Conclude not co-located based on SIC/NAICS codes or support.**

* "Guidance for Collocation/Single Source Determinations," issued by Elizabeth Basil, dated 10/28/2016, was utilized in the generation of this table.

Conclusion: Ameresco Biomass Cogeneration Facility, Salt Waste Processing Facility, and the Research and Development (R&D) Activities performed at leased facilities within the Savannah River Research Campus maintained by Aiken County and on SRS property are co-located facilities/activities. The Three Rivers Solid Waste Authority Regional Landfill is not co-located facilities with SRS. Simplistically speaking the Landfill is not dependent on the presence of SRS to perform their services.

DHEC Form 2566 – Equipment List/Process Information - Attachment C

"Modify" was selected if impacted by chemical flowsheet change
"Remove" was selected if equipment was being removed due to no longer emitting any regulated pollutants or if physically Abandoned In Place (AIP)
"Existing was selected if equipment was part of the vitrification process and will not be impacted by modification
For equipment outside of the vitrification process per the June 15, 1999 SCDHEC guidance titled, "Guidance document for Standard 4, Section VIII – PM Emission Limitations" it was only listed on the table if impacted by the modification. These are annotated as "IA" at the end of the description

Equipment ID/Process ID	Action	Equipment/Process Description	Maximum Design Capacity (Units)	Control Device ID(s)	Emission Point ID(s)
266S	Modify – change in chemical flowsheet	Slurry Mix Evaporator (SME)	60 Batches	CD-J 0005	EP-S D P 007
267S	Modify – change in chemical flowsheet	Sludge Receipt and Adjustment Tank (SRAT)	60 Batches	CD-J 0005	EP-S D P 007
270S	Modify – change in chemical flowsheet	Melter	60 Batches	None	EP-S D P 007
275S	Modify – change in chemical flowsheet	Precipitate Reactor Feed Tank	60 Batches	None	EP-S D P 007
264S	Modify – change in chemical flowsheet	Decontaminate Waste Treatment Tank	60 Batches	None	EP-S D P 007
256S	Modify – change in chemical flowsheet	SME Isolation Pot	60 Batches	CD-J 0005	EP-S D P 007
278S	Modify – change in chemical flowsheet	Offgas Condensate Tank 1	60 Batches	None	EP-S D P 007
488S	Modify – change in chemical flowsheet	Offgas Condensate Tank 2	60 Batches	None	EP-S D P 007
388S	Modify – change in chemical flowsheet	Crane Decon Feed Tank	60 Batches	None	EP-S D P 007
176S	Existing – no change	Sludge Tank (5800 gal)	60 Batches	None	ES-S D P 001
177S	Existing – no change	Recycle Tank (5800 gal)	60 Batches	None	ES-S D P 001

DHEC Form 2566 – Equipment List/Process Information - Attachment C

178S	Existing – no change	Precipitate Tank (5800 gal)	60 Batches	None	ES-S D P 001
121S	Remove – will not emit regulated pollutants	Currently 90% Formic Acid Feed Tank (600 gal) rename Glycolic Acid Feed Tank (600 gal)	NA – will not emit regulated pollutants	None	EP-S D P 009
111S	Existing – no change	Nitric Acid Dilution Tank (100 gal)	3600 gal/yr		EP-S D P 009
109S	Existing – no change	Nitric Acid Decon Feed Tank (1100 gal)	72000 gal/yr		EP-S D P 009
108S	Remove – will not emit regulated pollutants	Process Frit Slurry Feed Tank (2800 gal)	NA – will not emit regulated pollutants	None	EP-S D P 009
107S	Remove – will not emit regulated pollutants	Frit Decon Slurry Feed Tank (780 gal)	NA – will not emit regulated pollutants	None	EP-S D P 009
106S	Remove - – will not emit regulated pollutants	Currently Copper Catalyst Feed Tank (180 gal) rename to Sodium Permanganate Feed Tank (180 gal)	30 gal/yr	None	EP-S D P 009
105S	Existing – no change	Additive Mix Feed Tank (180 gal)	21600 gal/yr	None	EP-S D P0009
103S	Remove - AIP	Oxalic Decon Feed Tank (1100 gal)	NA – AIP	None	EP-S D P 009
102S	Remove – will not emit regulated pollutants	Organic Acid Drain Tank (1200 gal)	NA – AIP	None	EP-S D P 009
101S	Existing – no change	Sodium Nitrite Feed Tank (600 gal)	112500 gal/yr	None	EP-S D P 009

DHEC Form 2566 – Equipment List/Process Information - Attachment C

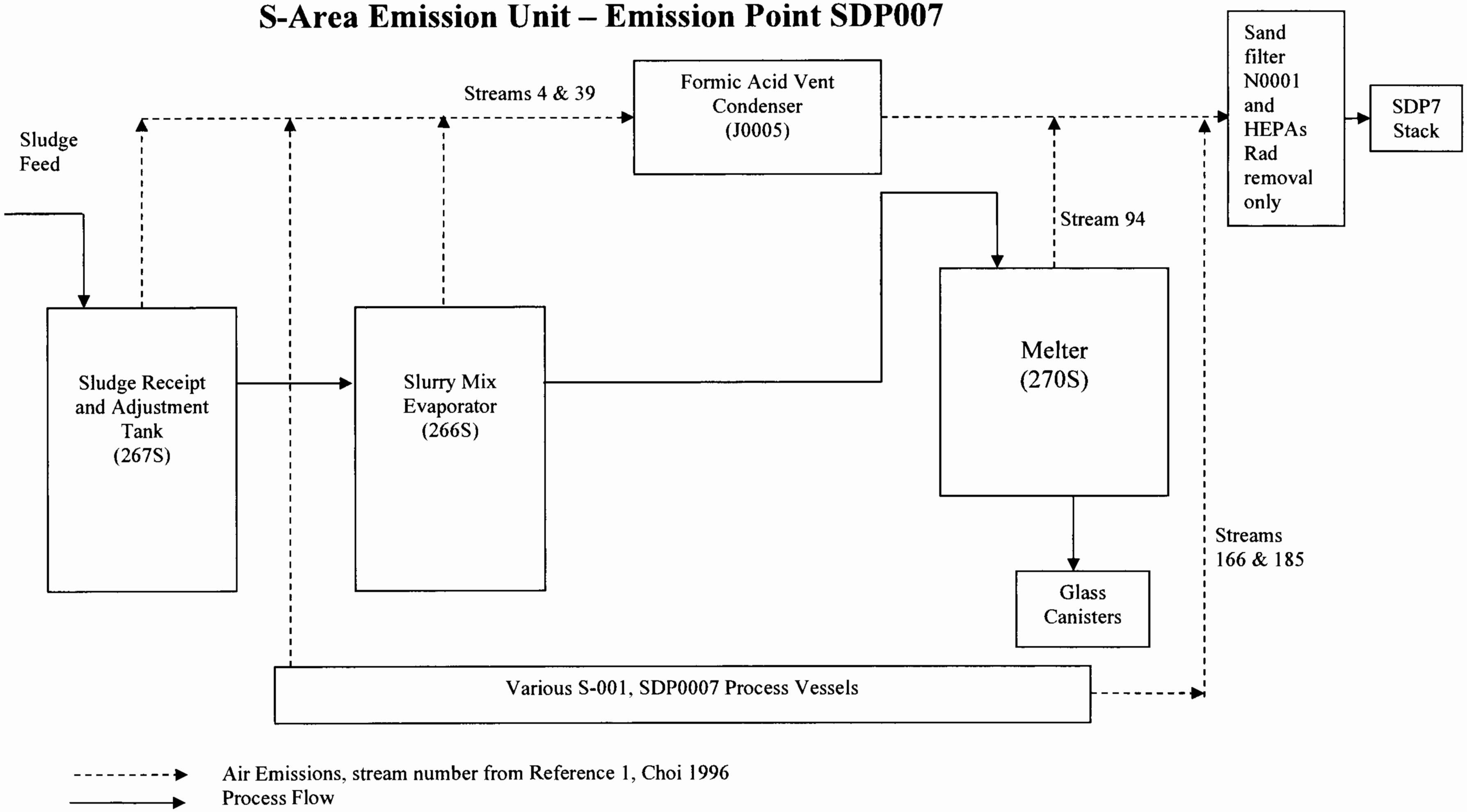
100S	Existing – no change	Nitric Acid Feed Tank (600 gal)	36000 gal/yr	None	EP-S D P 009
098S	Existing – no change	Acid Drain Catch Tank (1200 gal)	306000 gal/yr	None	EP-S D P 009
132S	Remove - AIP	Oxalic Acid Make Up Tank (1300 gal)	NA – AIP	None	EP-S D P 0019
131S	Remove - AIP	Formic Acid Feed Tank (2000 gal)	NA – AIP	None	EP-S D P 0019
129S	Remove - AIP	Formic Acid Dilution Tank (2000 gal)	NA – AIP	None	EP-S D P 0019
128S	Remove – will not emit regulated pollutants	Frit Slurry Make Up Tank (2300 gal)	NA – will not emit regulated pollutants	None	EP-S D P 0019
288S	Remove - AIP	Catalyst Make-up tank (550 gal) Raw Material Storage - IA	NA – AIP	None	EP-S D P 0067
291S	Modify – change in chemical flowsheet	Nitric Acid Decon Make-up tank (1300 gal) Raw Material Storage - IA	32000 gal/yr	None	EP-S D P 0067
293S	Modify – change in chemical flowsheet	50% Nitric Acid Storage Tank (1000 gal) Raw Material Storage - IA	15000 gal/yr	None	EP- S D P 0067
079S	Remove – will not emit regulated pollutants	Organic Waste/Neutralization Tank #1 (3150 gal) Waste/Chemical Treatment - IA	NA – will not emit regulated pollutants	None	EP- S D T 0035
020S	Remove – will not emit regulated pollutants	Organic Waste/ Neutralization Tank #2 (3150 gal)	NA – will not emit regulated pollutants	None	EP- S D T 0036

DHEC Form 2566 – Equipment List/Process Information - Attachment C

		Wase/Chemical Treatment - IA			
374S	Remove - AIP	Formic Acid Storage Tank #1, (6500 gal) Raw Material Storage - IA	NA – AIP	None	EP-S D T 0046
407S	Remove - AIP	Oxalic Acid Storage Tank (6000 gal) Raw Material Storage - IA	NA – AIP	None	EP-S D T 0046
298S	Remove – will not emit regulated pollutants	Currently Formic Acid Storage Tank #2 (6500 gal) After modification will be Glycolic Acid Storage Tank (6500 gal) Raw Material Storage - IA	NA – will not emit regulated pollutants	None	EP-S D T 0043

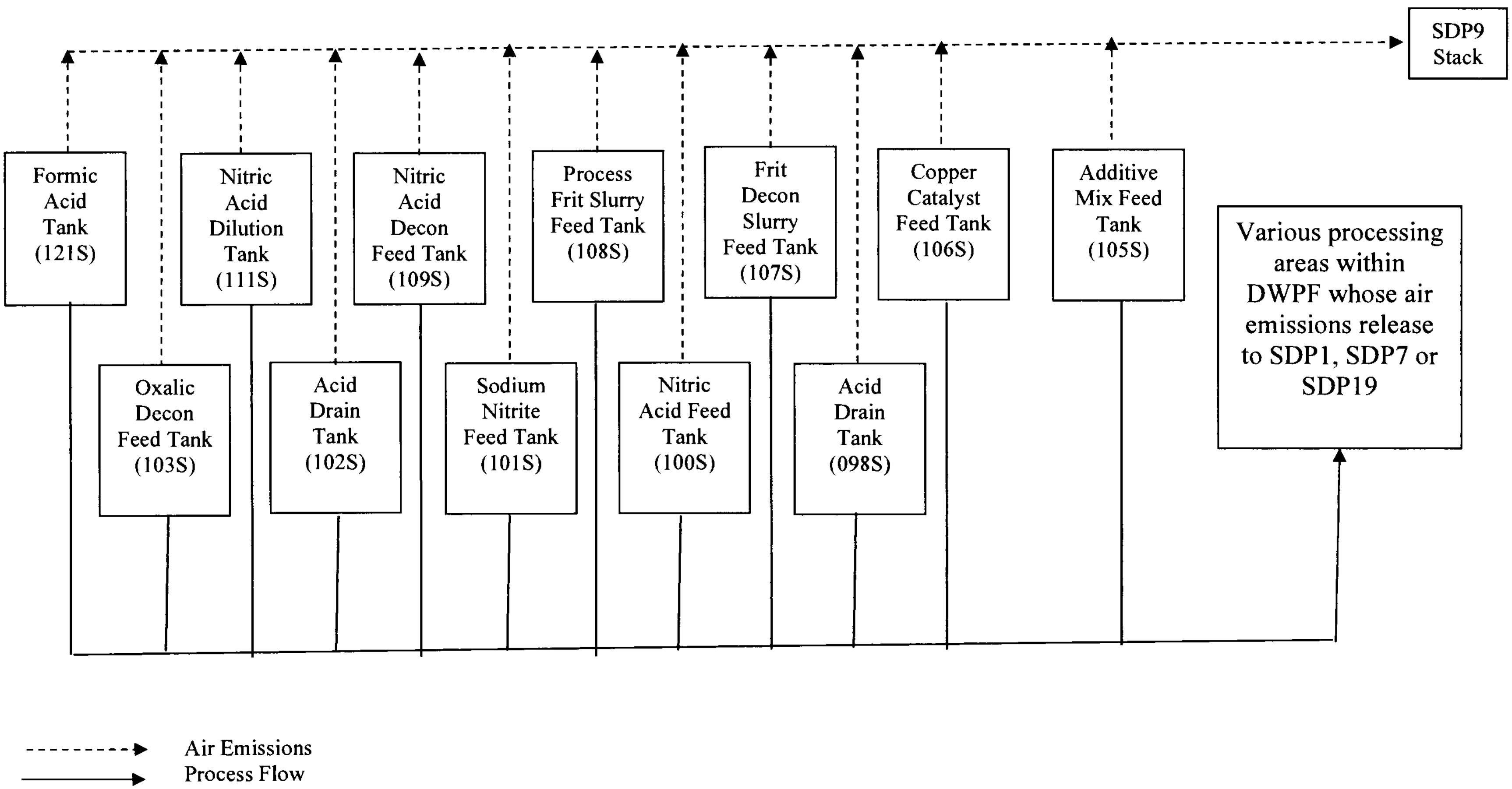
DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D
Pre-Modification

S-Area Emission Unit – Emission Point SDP007



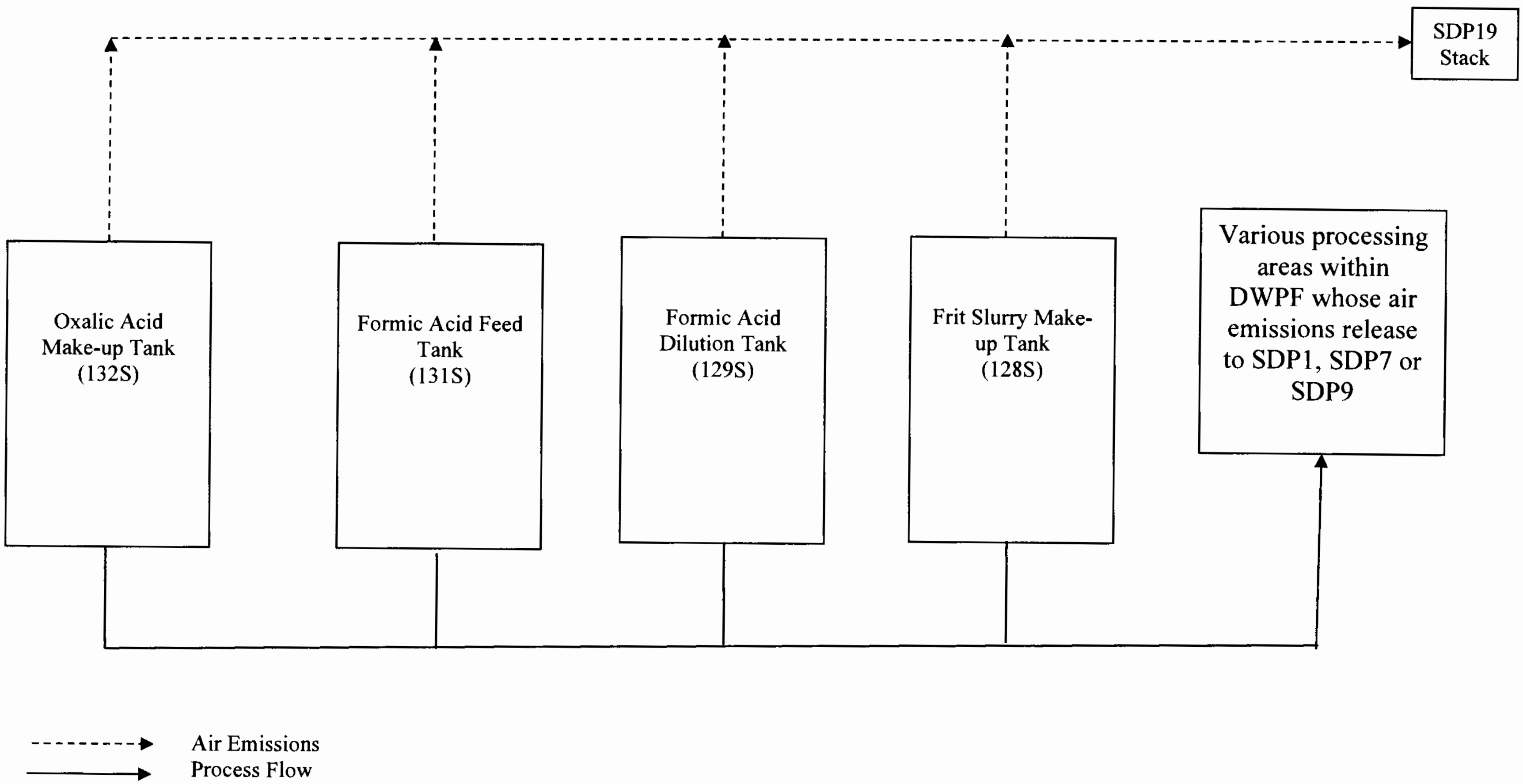
DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D
Pre-Modification

S-Area Emission Unit – Emission Point SDP009



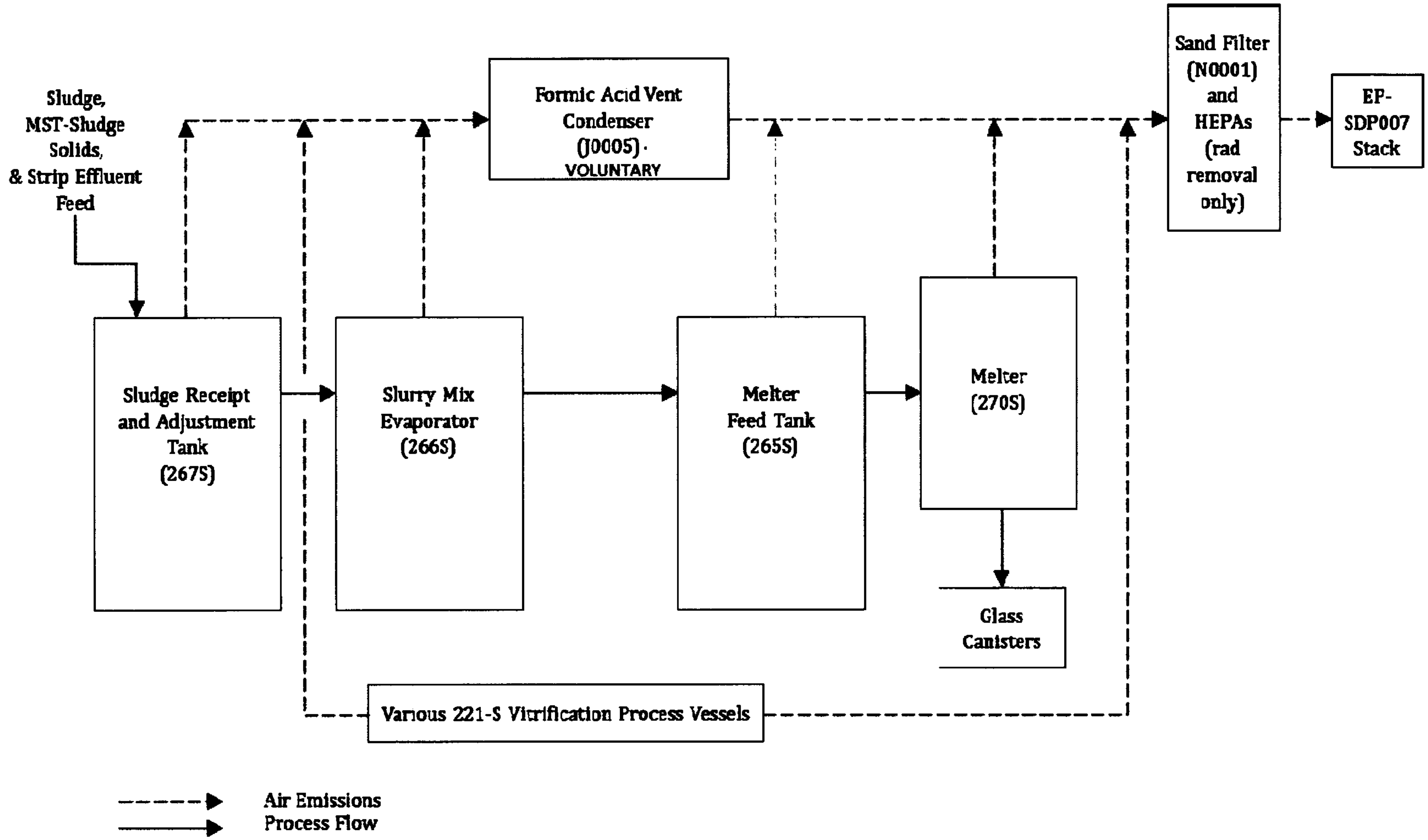
DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D
Pre-Modification

S-Area Emission Unit – Emission Point SDP0019



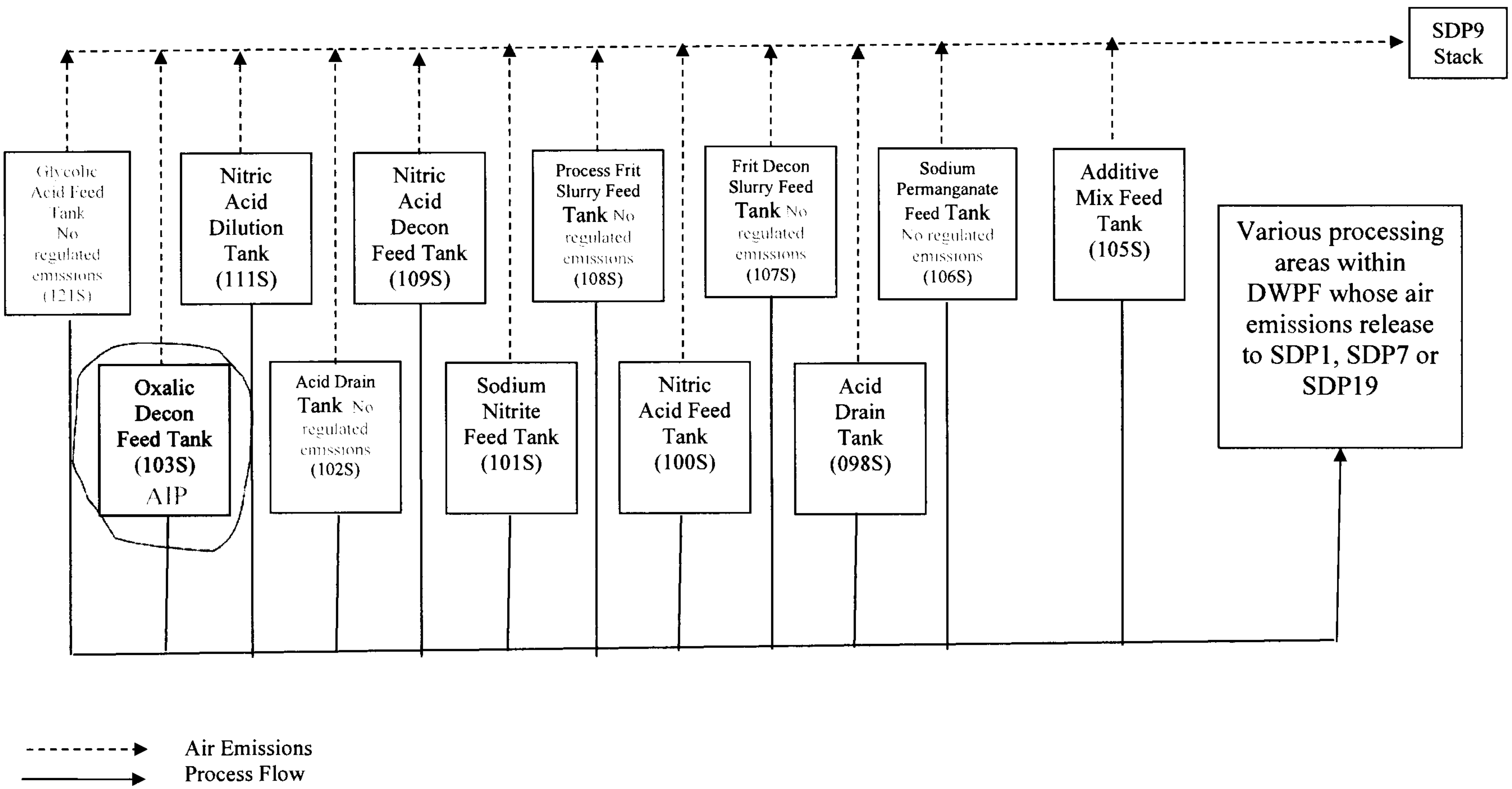
DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D

Post Modification



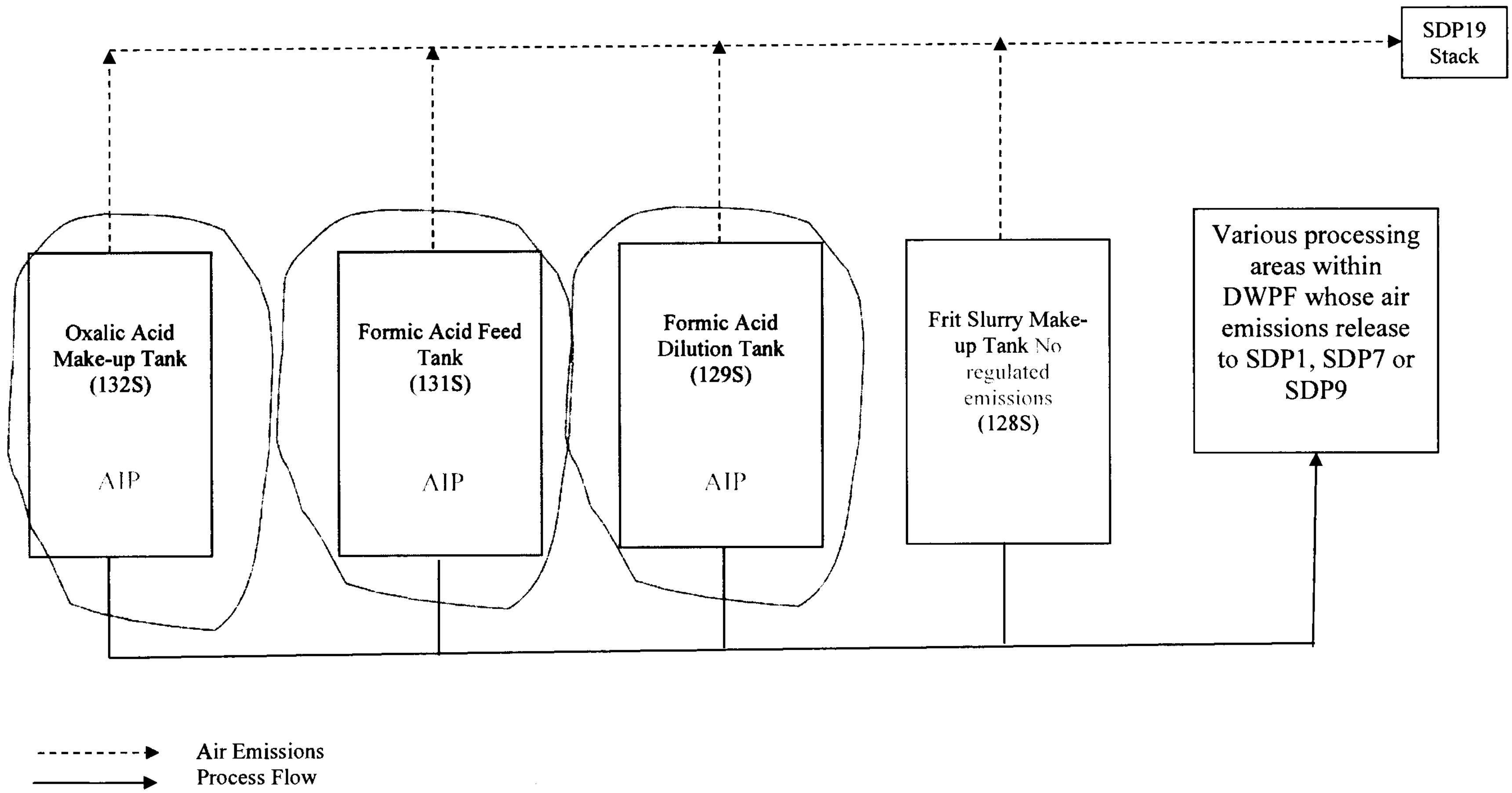
DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D
Post Modification

S-Area Emission Unit – Emission Point SDP009



DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D
Post Modification

S-Area Emission Unit – Emission Point SDP0019



DHEC Form 2566 –Emission Units Process Flowsheets - Attachment D

Insignificant Activities

Pre-Modification	**Post Modification**
288S, SDP0067 – on IA list	Remove from IA list - AIP
291S, SDP0067 – on IA list	Slight increase in nitric acid, still qualifies to be on IA list
293S, SDP0067 – on IA list	Slight increase in nitric acid, still qualifies to be on IA list
079S, SDT0035 – on IA list	Removed from IA list, no longer emits regulated pollutants
020S, SDT0036 – on IA list	Removed from IA list, no longer emits regulated pollutants
374S, SDT0046 – on IA list	Removed from IA list - AIP
407S, SDT0046 – on IA list	Removed from IA list - AIP
298S, SDT0043 – on IA list	Removed from IA list, no longer emits regulated pollutants

DHEC Form 2566 - After Modification Potential Emission Rates - Attachment E

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY							
Equipment ID / Process ID	**Emission Point ID**	**Pollutants (CAS#)**	**Calculation Methods / Limits Taken / Other Comments**	**Uncontrolled**		**Controlled**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**
267S, 266S,	SDP007	Carbon Dioxide (CAS 124-38-9)	Engineering Calculation: Q-ESR-00002_r1	8.31E+01	2.39E+02	8.31E+01	2.39E+02
270S, 275S,		PM	Engineering Calculations: SRNS-J2200-2019-00240	1.18E-01	3.28E-01	1.18E-01	3.28E-01
264S, 256S,		PM-10	Engineering Calculations: SRNS-J2200-2019-00240	1.18E-01	3.28E-01	1.18E-01	3.28E-01
278S, 488S,		PM-2.5	Engineering Calculations: SRNS-J2200-2019-00240	1.18E-01	3.28E-01	1.18E-01	3.28E-01
388S		Oxides of Nitrogen (NOx) as NO2	Engineering Calculation: Q-ESR-00002_r1	2.49E+01	6.43E+01	2.49E+01	6.43E+01
		Lead Compounds (PbO)	Engineering Calculations: 5RNS-J2200-2019-00240	1.69E-06	5.82E-06	1.69E-06	5.82E-06
		Nitrous Oxide (N2O) (CAS 1024-97-2)	Engineering Calculation: Q-E5R-00002_r1	3.70E+00	1.10E+01	3.70E+00	1.10E+01
		Carbon Monoxide (CAS 630-08-0)	Engineering Calculation: Q-ESR-00002_r1	2.50E+00	8.60E+00	2.50E+00	8.60E+00
121S	SDP009	No regulated Pollutants	Glycolic Acid Vapor Pressure is too low to emit				
111S	SDP009	Nitric Acid (CAS 7697-37-2)	SRNS-J2200-2019-00240 is bounding	6.39E-05	2.80E-04	6.39E-05	2.80E-04
109S	SDP009	Nitric Acid (CAS 7697-37-2)	SRNS-J2200-2019-00240 is bounding	5.41E-04	2.37E-03	5.41E-04	2.37E-03
109S	SDP009	PM	SRNS-J2200-2019-00240 is bounding	1.14E-06	5.00E-06	1.14E-06	5.00E-06
109S	SDP009	PM-10	SRNS-J2200-2019-00240 is bounding	1.14E-06	5.00E-06	1.14E-06	5.00E-06
109S	SDP009	PM-2.5	5RNS-J2200-2019-00240 is bounding	1.14E-06	5.00E-06	1.14E-06	5.00E-06
109S	SDP009	Manganese Compounds	SRNS-J2200-2019-00240 is bounding	1.14E-06	5.00E-06	1.14E-06	5.00E-06
108S	SDP009	No regulated Pollutants	Glycolic Acid Vapor Pressure is too low to emit				
107S	SDP009	No regulated Pollutants	Glycolic Acid Vapor Pressure is too low to emit				
106S	SDP009	No regulated Pollutants	Sodium Permanganate Vapor pressure is too low to emit				
105S	SDP009	VOC	SRNS-J2200-2019-00240 is bounding	2.40E-05	1.05E-04	2.40E-05	1.05E-04
102S	SDP009	No regulated Pollutants	No longer using oxalic acid				
101S	SDP009	PM	SRNS-J2200-2019-00240 is bounding	2.85E-05	1.25E-04	2.85E-05	1.25E-04
101S	SDP009	PM-10	SRNS-J2200-2019-00240 is bounding	2.85E-05	1.25E-04	2.85E-05	1.25E-04
101S	SDP009	PM-2.5	SRNS-J2200-2019-00240 is bounding	2.85E-05	1.25E-04	2.85E-05	1.25E-04
100S	SDP009	Nitric Acid (CAS 7697-37-2)	SRNS-J2200-2019-00240 is bounding	1.87E-03	8.21E-03	1.87E-03	8.21E-03
98S	SDP009	Nitric Acid (CAS 7697-37-2)	SRNS-J2200-2019-00240 is bounding	4.75E-03	2.08E-02	4.75E-03	2.08E-02
128S	SDP0019	No regulated Pollutants	Glycolic Acid Vapor Pressure is too low to emit				
176S, 177S	SDP001	PM	Modification does not impact this emission point. Included to allow for total of vitrification process. SRNS-J2200-2019-00240 is bounding	6.85E-05	3.00E-04	6.85E-05	3.00E-04
178S,		PM-10		6.85E-05	3.00E-04	6.85E-05	3.00E-04
		PM-2.5		6.85E-05	3.00E-04	6.85E-05	3.00E-04
		Manganese Compounds		3.42E-06	1.50E-05	3.42E-06	1.50E-05

DHEC Form 2566 - After Modification Potential Emission Rates - Attachment E

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY							
Equipment ID / Process ID	**Emission Point ID**	**Pollutants (CAS#)**	**Calculation Methods / Limits Taken / Other Comments**	**Uncontrolled**		**Controlled**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**
EU 16 S-Area	SDP001	PM	Totals for Vitrification Process	1.18E-01	3.28E-01	1.18E-01	3.28E-01
	SDP007	PM-10		1.18E-01	3.28E-01	1.18E-01	3.28E-01
	SDP009	PM-2.5		1.18E-01	3.28E-01	1.18E-01	3.28E-01
	SDP0019	Manganese Compounds		4.57E-06	2.00E-05	4.57E-06	2.00E-05
		Nitric Acid (CAS 7697-37-2)		7.22E-03	3.17E-02	7.22E-03	3.17E-02
		VOC		2.40E-05	1.05E-04	2.40E-05	1.05E-04
		Oxides of Nitrogen (NOx) as NO2		2.49E+01	6.43E+01	2.49E+01	6.43E+01
		Lead Compounds (PbO)		1.69E-06	5.82E-06	1.69E-06	5.82E-06
		Nitrous Oxide (N2O) (CAS 1024-97-2)		3.70E+00	1.10E+01	3.70E+00	1.10E+01
		Carbon Monoxide (CAS 630-08-0)		2.50E+00	8.60E+00	2.50E+00	8.60E+00
		Carbon Dioxide (CAS 124-38-9)		8.31E+01	2.39E+02	8.31E+01	2.39E+02

DHEC Form 2566 - Max PTE Emissions for Nitric-Glycolic Acid Flowsheet - Attachment F

		Uncontrolled						Controlled					
		SDP7	SDP7	other EPs	other EPs	Total DWPF process		SDP7	SDP7	other EPs	other EPs	Total DWPF process	
CAS #		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
630-08-0	Carbon monoxide	2.50E+00	8.60E+00			2.50E+00	8.60E+00	2.50E+00	8.60E+00			2.50E+00	8.60E+00
124-38-9	Carbon dioxide (GHG)	8.31E+01	2.39E+02			8.31E+01	2.39E+02	8.31E+01	2.39E+02			8.31E+01	2.39E+02
7697-37-2	Nitric acid			7.23E-03	3.17E-02	7.23E-03	3.17E-02			7.23E-03	3.17E-02	7.23E-03	3.17E-02
1024-97-2	Nitrous oxide (GHG)	3.70E+00	1.10E+01			3.70E+00	1.10E+01	3.70E+00	1.10E+01			3.70E+00	1.10E+01
	Total Particulate	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	PM-10	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	PM-2.5	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	Nitrogen oxides (NO2) [MW=46.01]	2.49E+01	6.43E+01			2.49E+01	6.43E+01	2.49E+01	6.43E+01			2.49E+01	6.43E+01
	VOC			2.40E-05	1.05E-04	2.40E-05	1.05E-04			2.40E-05	1.05E-04	2.40E-05	1.05E-04
	Lead compounds (PbO)	1.69E-06	5.82E-06			1.69E-06	5.82E-06	1.69E-06	5.82E-06			1.69E-06	5.82E-06
	Manganese compounds (MnO2)			4.57E-06	2.00E-05	4.57E-06	2.00E-05			4.57E-06	2.00E-05	4.57E-06	2.00E-05

DHEC Form 2566 - SRS Facility-Wide Emissions Pre-Modification - Attachment G

Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total	Controlled SRS	Controlled Ameresco	Total
CO	3.49E+02	4.58E+02	8.07E+02	3.49E+02	4.57E+02	8.06E+02
Nitrogen Dioxide (NO2)	4.06E+02	5.26E+02	9.32E+02	3.94E+02	3.68E+02	7.62E+02
NOx	5.27E+02	5.26E+02	1.05E+03	5.15E+02	3.68E+02	8.83E+02
Pb	1.55E-01	2.02E-01	3.57E-01	3.73E-02	2.02E-01	2.39E-01
PM	1.15E+03	1.58E+03	2.73E+03	6.21E+01	2.12E+02	2.74E+02
PM10	4.64E+02	1.58E+03	2.04E+03	5.76E+01	2.12E+02	2.70E+02
PM2.5	4.34E+02	1.58E+03	2.01E+03	3.62E+01	2.12E+02	2.48E+02
SO2	6.62E+01	2.77E+03	2.84E+03	6.62E+01	5.31E+02	5.97E+02
VOC	1.94E+02	8.65E+01	2.80E+02	1.94E+02	8.65E+01	2.80E+02
1,1,1-Trichloroethane (Methy	5.39E-02	7.14E-02	1.25E-01	5.39E-02	7.14E-02	1.25E-01
1,1-dichloroethylene (vinyli	1.33E-02		1.33E-02	1.33E-02		1.33E-02
1,4-Dioxane	4.51E-02		4.51E-02	4.51E-02		4.51E-02
Acetaldehyde	1.55E-06	4.02E-01	4.02E-01	1.55E-06	4.02E-01	4.02E-01
Acrylonitrile	2.60E-10		2.60E-10	2.60E-10		2.60E-10
Antimony Compounds	2.68E-08	1.82E-02	1.82E-02	2.68E-08	1.82E-02	1.82E-02
Benzene	2.08E+00	2.55E+00	4.63E+00	2.08E+00	2.55E+00	4.63E+00
Cadmium	8.68E-07	3.89E-02	3.89E-02	8.68E-07	3.89E-02	3.89E-02
Carbon Disulfide	1.42E-05		1.42E-05	1.42E-05		1.42E-05
Carbon Tetrachloride	1.46E-01	1.04E-01	2.49E-01	1.46E-01	1.04E-01	2.49E-01
Chlorine	4.34E-01	1.82E+00	2.25E+00	4.34E-01	1.82E+00	2.25E+00
Chloroform	4.66E-03	6.45E-02	6.91E-02	4.66E-03	6.45E-02	6.91E-02
Chromium Compounds	2.95E-01	3.62E-02	3.31E-01	2.95E-01	3.62E-02	3.31E-01
Cumene	1.72E-02		1.72E-02	1.72E-02		1.72E-02
Ethylbenzene	3.16E-01	7.14E-02	3.88E-01	3.16E-01	7.14E-02	3.88E-01
Formaldehyde	8.12E-01	2.83E+00	3.64E+00	8.12E-01	2.83E+00	3.64E+00
formic acid	1.78E-01		1.78E-01	1.40E-01		1.40E-01
Hexane	2.08E-01		2.08E-01	2.08E-01		2.08E-01
Hydrochloric Acid	3.33E+00	2.51E+01	2.85E+01	3.33E+00	1.02E+01	1.36E+01
Hydrogen cyanide	1.07E-02		1.07E-02	1.07E-02		1.07E-02
Hydrogen Sulfide	2.96E-04		2.96E-04	2.96E-04		2.96E-04
Lead Compounds	6.71E-05		6.71E-05	6.71E-05		6.71E-05
Manganese compounds	7.71E-01		7.71E-01	7.71E-01		7.71E-01
Mercury	1.71E-01	7.90E-03	1.79E-01	1.71E-01	7.90E-03	1.79E-01
Methanol	2.00E-02	9.22E-01	9.42E-01	2.00E-02	9.22E-01	9.42E-01
Methyl Ethyl Ketone	6.22E-03		6.22E-03	6.22E-03		6.22E-03
Methyl Isobutyl Ketone	3.14E-02		3.14E-02	3.14E-02		3.14E-02
Methylene Chloride (Dichloro	9.16E-03	6.68E-01	6.77E-01	9.16E-03	6.68E-01	6.77E-01
Naphthalene	6.65E-06	2.23E-01	2.23E-01	6.65E-06	2.23E-01	2.23E-01
Nickel Compounds	1.77E-01		1.77E-01	1.77E-01		1.77E-01
nickel oxide	1.53E-04		1.53E-04	1.53E-04		1.53E-04
Nickel	1.77E-01	3.37E-02	2.11E-01	1.77E-01	3.37E-02	2.11E-01
nitric acid	1.67E+02		1.67E+02	1.67E+02		1.67E+02
Oxalic Acid	1.05E-01		1.05E-01	1.05E-01		1.05E-01
Sodium Hydroxide	1.19E+00		1.19E+00	1.19E+00		1.19E+00
Styrene	3.33E-01	1.07E+00	1.41E+00	3.33E-01	1.07E+00	1.41E+00
Tetrachloroethylene (Perchl	3.54E+01	8.75E-02	3.55E+01	3.54E+01	8.75E-02	3.55E+01
Toluene	1.46E+00	2.12E+00	3.58E+00	1.46E+00	2.12E+00	3.58E+00
Trichloroethylene	2.30E+01	6.91E-02	2.30E+01	2.30E+01	6.91E-02	2.30E+01
Vinyl Chloride	5.84E-03	4.14E-02	4.73E-02	5.84E-03	4.14E-02	4.73E-02
Xylene (m-)	2.45E+00		2.45E+00	2.45E+00		2.45E+00
Xylene(o-)	8.11E-03	5.76E-02	6.57E-02	8.11E-03	5.76E-02	6.57E-02
Xylenes	2.34E-02		2.34E-02	2.34E-02		2.34E-02
Acenaphthene (POM)		2.09E-03	2.09E-03		2.09E-03	2.09E-03

DHEC Form 2566 - SRS Facility-Wide Emissions Pre-Modification - Attachment G

Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total	Controlled SRS	Controlled Ameresco	Total
Acenaphthylene (POM)		1.15E-02	1.15E-02		1.15E-02	1.15E-02
Acetophenone		7.37E-06	7.37E-06		7.37E-06	7.37E-06
Acrolein		3.87E+00	3.87E+00		3.87E+00	3.87E+00
Anthracene (POM)		6.91E-03	6.91E-03		6.91E-03	6.91E-03
Benzo(a)anthracene (POM, PAH)		1.50E-04	1.50E-04		1.50E-04	1.50E-04
Benzo(a)pyrene (POM, PAH)		5.99E-03	5.99E-03		5.99E-03	5.99E-03
Benzo(b)fluoranthene (POM, PAH)		2.30E-04	2.30E-04		2.30E-04	2.30E-04
Benzo(b,k)fluoranthene (POM, PAH)		1.92E-05	1.92E-05		1.92E-05	1.92E-05
Benzo(e)pyrene		5.99E-06	5.99E-06		5.99E-06	5.99E-06
Benzo(g,h,i)perylene (POM)		2.14E-04	2.14E-04		2.14E-04	2.14E-04
Benzo(j,k)fluoranthene		3.68E-04	3.68E-04		3.68E-04	3.68E-04
Benzo(k)fluoranthene (POM)		8.29E-05	8.29E-05		8.29E-05	8.29E-05
Bis(2-Ethylhexyl)phthalate (DEHP)		1.08E-04	1.08E-04		1.08E-04	1.08E-04
Bromomethane (methyl bromide)		3.45E-02	3.45E-02		3.45E-02	3.45E-02
Chlorobenzene		7.60E-02	7.60E-02		7.60E-02	7.60E-02
Chloromethane (Methyl chloride)		5.30E-02	5.30E-02		5.30E-02	5.30E-02
Chrysene (POM)		8.75E-05	8.75E-05		8.75E-05	8.75E-05
Dibenzo(a,h)anthracene (POM)		2.74E-05	2.74E-05		2.74E-05	2.74E-05
1,2-Dichloroethane (Ethylene dichloride)		6.68E-02	6.68E-02		6.68E-02	6.68E-02
1,2-Dichloropropane (Propylene dichloride)		7.60E-02	7.60E-02		7.60E-02	7.60E-02
2,4-Dinitrophenol		4.14E-04	4.14E-04		4.14E-04	4.14E-04
Fluoranthene (POM)		3.68E-03	3.68E-03		3.68E-03	3.68E-03
Fluorene (POM)		7.83E-03	7.83E-03		7.83E-03	7.83E-03
Heptachlorodibenzo-p-dioxins		4.60E-06	4.60E-06		4.60E-06	4.60E-06
Heptachlorodibenzo-p-furans		5.53E-07	5.53E-07		5.53E-07	5.53E-07
Hexachlorodibenzo-p-dioxins		3.68E-03	3.68E-03		3.68E-03	3.68E-03
Hexachlorodibenzo-p-furans		6.45E-07	6.45E-07		6.45E-07	6.45E-07
Octachlorodibenzo-p-dioxins		1.52E-04	1.52E-04		1.52E-04	1.52E-04
Octachlorodibenzo-p-furans		2.03E-07	2.03E-07		2.03E-07	2.03E-07
Pentachlorodibenzo-p-dioxins		3.45E-06	3.45E-06		3.45E-06	3.45E-06
Pentachlorodibenzo-p-furans		9.67E-07	9.67E-07		9.67E-07	9.67E-07
2,3,7,8-Tetrachlorodibenzo-p-furans		2.07E-07	2.07E-07		2.07E-07	2.07E-07
Tetrachlorodibenzo-p-furans		1.73E-06	1.73E-06		1.73E-06	1.73E-06
Indeno(1,2,3,c,d)pyrene (POM, PAH)		2.00E-04	2.00E-04		2.00E-04	2.00E-04
4-Nitrophenol		2.53E-04	2.53E-04		2.53E-04	2.53E-04
Pentachlorophenol		1.17E-04	1.17E-04		1.17E-04	1.17E-04
Phenanthrene (POM)		1.61E-02	1.61E-02		1.61E-02	1.61E-02
Phenol		1.17E-01	1.17E-01		1.17E-01	1.17E-01
PCB (Polychlorinated Biphenyls)		1.88E-05	1.88E-05		1.88E-05	1.88E-05
POM (Polycyclic Organic Matter)		2.88E-01	2.88E-01		2.88E-01	2.88E-01
Propionaldehyde		1.40E-01	1.40E-01		1.40E-01	1.40E-01
Pyrene (POM)		8.52E-03	8.52E-03		8.52E-03	8.52E-03
2,3,7,8-Tetrachlorodibenzo-p-dioxins		3.98E-09	3.98E-09		3.98E-09	3.98E-09
Tetrachlorodibenzo-p-dioxins		2.17E-07	2.17E-07		2.17E-07	2.17E-07
2,4,6-Trichlorophenol		5.06E-05	5.06E-05		5.06E-05	5.06E-05
Arsenic		2.86E-02	2.86E-02		2.86E-02	2.86E-02
Beryllium		6.64E-03	6.64E-03		6.64E-03	6.64E-03
Chromium		2.81E-02	2.81E-02		2.81E-02	2.81E-02
Chromium (Hex)		8.06E-03	8.06E-03		8.06E-03	8.06E-03
Cobalt		1.50E-02	1.50E-02		1.50E-02	1.50E-02
Manganese		1.02E+00	1.02E+00		1.02E+00	1.02E+00
Phosphorus		6.22E-02	6.22E-02		6.22E-02	6.22E-02
Selenium		3.32E-02	3.32E-02		3.32E-02	3.32E-02
Total			2.84E+02			2.69E+02

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Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total
1112344555-Decafluoropentane	3.84E-01		
CO2	1.11E+05		
Methane	6.74E+02		
Nitrous Oxide (N2O)	2.70E+00		
CO2e	1.29E+05	4.79E+05	6.08E+05
Used Table A-1 of Supbart A of Part 98 for GWPs			

Controlled SRS	Controlled Ameresco	Total
3.84E-01		
1.11E+05		
6.74E+02		
2.70E+00		
1.29E+05	4.79E+05	6.08E+05

Note: The last facility wide emissions submitted to SCDHEC was in support of the construction permit application for Surplus Plutonium Disposition in January 2020. Several Insignificant Activities (IAs) that are insignificant due to their emissions levels have been added to the site's IAs List. Among these additions are numerous Internal Combustion Engines. These engines were exempt from construction permitting and were insignificant activities due their emission level. Due to the number of engines and the requirement to apply 8760 hours/year run time for maximum potential to emit calculations these additions to the IA list impact the facility wide emissions for PM, SOx, NOx, CO, VOC, CO2 and methane emissions.

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Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total	Controlled SRS	Controlled Ameresco	Total
CO	3.58E+02	4.58E+02	8.15E+02	3.58E+02	4.57E+02	8.14E+02
Nitrogen Dioxide (NO2)	4.27E+02	5.26E+02	9.53E+02	4.15E+02	3.68E+02	7.83E+02
NOx	5.49E+02	5.26E+02	1.07E+03	5.36E+02	3.68E+02	9.05E+02
Pb	1.55E-01	2.02E-01	3.57E-01	3.73E-02	2.02E-01	2.39E-01
PM	1.15E+03	1.58E+03	2.73E+03	6.21E+01	2.12E+02	2.74E+02
PM10	4.64E+02	1.58E+03	2.04E+03	5.76E+01	2.12E+02	2.70E+02
PM2.5	4.34E+02	1.58E+03	2.01E+03	3.61E+01	2.12E+02	2.48E+02
SO2	6.62E+01	2.77E+03	2.84E+03	6.62E+01	5.31E+02	5.97E+02
VOC	1.94E+02	8.65E+01	2.80E+02	1.94E+02	8.65E+01	2.80E+02
1,1,1-Trichloroethane (Methy	5.39E-02	7.14E-02	1.25E-01	5.39E-02	7.14E-02	1.25E-01
1,1-dichloroethylene (vinyli	1.33E-02		1.33E-02	1.33E-02		1.33E-02
1,4-Dioxane	4.51E-02		4.51E-02	4.51E-02		4.51E-02
Acetaldehyde	1.55E-06	4.02E-01	4.02E-01	1.55E-06	4.02E-01	4.02E-01
Acrylonitrile	2.60E-10		2.60E-10	2.60E-10		2.60E-10
Antimony Compounds	2.68E-08	1.82E-02	1.82E-02	2.68E-08	1.82E-02	1.82E-02
Benzene	2.08E+00	2.55E+00	4.63E+00	2.08E+00	2.55E+00	4.63E+00
Cadmium	8.68E-07	3.89E-02	3.89E-02	8.68E-07	3.89E-02	3.89E-02
Carbon Disulfide	1.42E-05		1.42E-05	1.42E-05		1.42E-05
Carbon Tetrachloride	1.46E-01	1.04E-01	2.49E-01	1.46E-01	1.04E-01	2.49E-01
Chlorine	4.34E-01	1.82E+00	2.25E+00	4.34E-01	1.82E+00	2.25E+00
Chloroform	4.66E-03	6.45E-02	6.91E-02	4.66E-03	6.45E-02	6.91E-02
Chromium Compounds	2.95E-01	3.62E-02	3.31E-01	2.95E-01	3.62E-02	3.31E-01
Cumene	1.72E-02		1.72E-02	1.72E-02		1.72E-02
Ethylbenzene	3.16E-01	7.14E-02	3.88E-01	3.16E-01	7.14E-02	3.88E-01
Formaldehyde	8.12E-01	2.83E+00	3.64E+00	8.12E-01	2.83E+00	3.64E+00
formic acid	0.00E+00		0.00E+00	0.00E+00		0.00E+00
Hexane	2.08E-01		2.08E-01	2.08E-01		2.08E-01
Hydrochloric Acid	3.33E+00	2.51E+01	2.85E+01	3.33E+00	1.02E+01	1.36E+01
Hydrogen cyanide	1.07E-02		1.07E-02	1.07E-02		1.07E-02
Hydrogen Sulfide	2.96E-04		2.96E-04	2.96E-04		2.96E-04
Lead Compounds	7.29E-05		7.29E-05	7.29E-05		7.29E-05
Manganese compounds	7.71E-01		7.71E-01	7.71E-01		7.71E-01
Mercury	1.71E-01	7.90E-03	1.79E-01	1.71E-01	7.90E-03	1.79E-01
Methanol	2.00E-02	9.22E-01	9.42E-01	2.00E-02	9.22E-01	9.42E-01
Methyl Ethyl Ketone	6.22E-03		6.22E-03	6.22E-03		6.22E-03
Methyl Isobutyl Ketone	3.14E-02		3.14E-02	3.14E-02		3.14E-02
Methylene Chloride (Dichloro	9.16E-03	6.68E-01	6.77E-01	9.16E-03	6.68E-01	6.77E-01
Naphthalene	6.65E-06	2.23E-01	2.23E-01	6.65E-06	2.23E-01	2.23E-01
Nickel Compounds	1.77E-01		1.77E-01	1.77E-01		1.77E-01
nickel oxide	1.53E-04		1.53E-04	1.53E-04		1.53E-04
Nickel	1.77E-01	3.37E-02	2.11E-01	1.77E-01	3.37E-02	2.11E-01
nitric acid	1.64E+02		1.64E+02	1.64E+02		1.64E+02
Oxalic Acid	9.04E-02		9.04E-02	9.04E-02		9.04E-02
Sodium Hydroxide	1.19E+00		1.19E+00	1.19E+00		1.19E+00
Styrene	3.33E-01	1.07E+00	1.41E+00	3.33E-01	1.07E+00	1.41E+00
Tetrachloroethylene (Perchl	3.54E+01	8.75E-02	3.55E+01	3.54E+01	8.75E-02	3.55E+01
Toluene	1.46E+00	2.12E+00	3.58E+00	1.46E+00	2.12E+00	3.58E+00
Trichloroethylene	2.30E+01	6.91E-02	2.30E+01	2.30E+01	6.91E-02	2.30E+01
Vinyl Chloride	5.84E-03	4.14E-02	4.73E-02	5.84E-03	4.14E-02	4.73E-02
Xylene (m-)	2.45E+00		2.45E+00	2.45E+00		2.45E+00
Xylene(o-)	8.11E-03	5.76E-02	6.57E-02	8.11E-03	5.76E-02	6.57E-02
Xylenes	2.34E-02		2.34E-02	2.34E-02		2.34E-02
Acenaphthene (POM)		2.09E-03	2.09E-03		2.09E-03	2.09E-03
Acenaphthylene (POM)		1.15E-02	1.15E-02		1.15E-02	1.15E-02

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Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total	Controlled SRS	Controlled Ameresco	Total
Acetophenone		7.37E-06	7.37E-06		7.37E-06	7.37E-06
Acrolein		3.87E+00	3.87E+00		3.87E+00	3.87E+00
Anthracene (POM)		6.91E-03	6.91E-03		6.91E-03	6.91E-03
Benzo(a)anthracene (POM, PAH)		1.50E-04	1.50E-04		1.50E-04	1.50E-04
Benzo(a)pyrene (POM, PAH)		5.99E-03	5.99E-03		5.99E-03	5.99E-03
Benzo(b)fluoranthene (POM, PAH)		2.30E-04	2.30E-04		2.30E-04	2.30E-04
Benzo(b,k)fluoranthene (POM, PAH)		1.92E-05	1.92E-05		1.92E-05	1.92E-05
Benzo(e)pyrene		5.99E-06	5.99E-06		5.99E-06	5.99E-06
Benzo(g,h,i)perylene (POM)		2.14E-04	2.14E-04		2.14E-04	2.14E-04
Benzo(j,k)fluoranthene		3.68E-04	3.68E-04		3.68E-04	3.68E-04
Benzo(k)fluoranthene (POM)		8.29E-05	8.29E-05		8.29E-05	8.29E-05
Bis(2-Ethylhexyl)phthalate (DEHP)		1.08E-04	1.08E-04		1.08E-04	1.08E-04
Bromomethane (methyl bromide)		3.45E-02	3.45E-02		3.45E-02	3.45E-02
Chlorobenzene		7.60E-02	7.60E-02		7.60E-02	7.60E-02
Chloromethane (Methyl chloride)		5.30E-02	5.30E-02		5.30E-02	5.30E-02
Chrysene (POM)		8.75E-05	8.75E-05		8.75E-05	8.75E-05
Dibenzo(a,h)anthracene (POM)		2.74E-05	2.74E-05		2.74E-05	2.74E-05
1,2-Dichloroethane (Ethylene dichloride)		6.68E-02	6.68E-02		6.68E-02	6.68E-02
1,2-Dichloropropane (Propylene dichloride)		7.60E-02	7.60E-02		7.60E-02	7.60E-02
2,4-Dinitrophenol		4.14E-04	4.14E-04		4.14E-04	4.14E-04
Fluoranthene (POM)		3.68E-03	3.68E-03		3.68E-03	3.68E-03
Fluorene (POM)		7.83E-03	7.83E-03		7.83E-03	7.83E-03
Heptachlorodibenzo-p-dioxins		4.60E-06	4.60E-06		4.60E-06	4.60E-06
Heptachlorodibenzo-p-furans		5.53E-07	5.53E-07		5.53E-07	5.53E-07
Hexachlorodibenzo-p-dioxins		3.68E-03	3.68E-03		3.68E-03	3.68E-03
Hexachlorodibenzo-p-furans		6.45E-07	6.45E-07		6.45E-07	6.45E-07
Octachlorodibenzo-p-dioxins		1.52E-04	1.52E-04		1.52E-04	1.52E-04
Octachlorodibenzo-p-furans		2.03E-07	2.03E-07		2.03E-07	2.03E-07
Pentachlorodibenzo-p-dioxins		3.45E-06	3.45E-06		3.45E-06	3.45E-06
Pentachlorodibenzo-p-furans		9.67E-07	9.67E-07		9.67E-07	9.67E-07
2,3,7,8-Tetrachlorodibenzo-p-furans		2.07E-07	2.07E-07		2.07E-07	2.07E-07
Tetrachlorodibenzo-p-furans		1.73E-06	1.73E-06		1.73E-06	1.73E-06
Indeno(1,2,3,c,d)pyrene (POM, PAH)		2.00E-04	2.00E-04		2.00E-04	2.00E-04
4-Nitrophenol		2.53E-04	2.53E-04		2.53E-04	2.53E-04
Pentachlorophenol		1.17E-04	1.17E-04		1.17E-04	1.17E-04
Phenanthrene (POM)		1.61E-02	1.61E-02		1.61E-02	1.61E-02
Phenol		1.17E-01	1.17E-01		1.17E-01	1.17E-01
PCB (Polychlorinated Biphenyls)		1.88E-05	1.88E-05		1.88E-05	1.88E-05
POM (Polycyclic Organic Matter)		2.88E-01	2.88E-01		2.88E-01	2.88E-01
Propionaldehyde		1.40E-01	1.40E-01		1.40E-01	1.40E-01
Pyrene (POM)		8.52E-03	8.52E-03		8.52E-03	8.52E-03
2,3,7,8-Tetrachlorodibenzo-p-dioxins		3.98E-09	3.98E-09		3.98E-09	3.98E-09
Tetrachlorodibenzo-p-dioxins		2.17E-07	2.17E-07		2.17E-07	2.17E-07
2,4,6-Trichlorophenol		5.06E-05	5.06E-05		5.06E-05	5.06E-05
Arsenic		2.86E-02	2.86E-02		2.86E-02	2.86E-02
Beryllium		6.64E-03	6.64E-03		6.64E-03	6.64E-03
Chromium		2.81E-02	2.81E-02		2.81E-02	2.81E-02
Chromium (Hex)		8.06E-03	8.06E-03		8.06E-03	8.06E-03
Cobalt		1.50E-02	1.50E-02		1.50E-02	1.50E-02
Manganese		1.02E+00	1.02E+00		1.02E+00	1.02E+00
Phosphorus		6.22E-02	6.22E-02		6.22E-02	6.22E-02
Selenium		3.32E-02	3.32E-02		3.32E-02	3.32E-02
Total			2.81E+02			2.66E+02

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Pollutant	Uncontrolled SRS	Uncontrolled Ameresco	Total
1112344555-Decafluoropentane	3.84E-01		
CO2	1.11E+05		
Methane	6.74E+02		
Nitrous Oxide (N2O)	1.37E+01		
CO2e	1.32E+05	4.79E+05	6.12E+05
Used Table A-1 of Supbart A of Part 98 for GWPs			

Controlled SRS	Controlled Ameresco	Total
3.84E-01		
1.11E+05		
6.74E+02		
1.37E+01		
1.32E+05	4.79E+05	6.12E+05

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

PURPOSE:

The Defense Waste Process Facility (DWPF) processes high level waste into a stable glass form. This is achieved by mixing the radioactive waste with silica sand, melting the mixture, and pouring the mixture into stainless steel canisters.

The process consists of several process units. The June 15, 1999 SCDHEC guidance titled, "Guidance document for Standard 4, Section VIII – PM Emission Limitations" was used to identify which pieces of equipment is part of the DWPF process and which pieces are not. The following summarizes this review. A column has been added to identify any impacts resulting form switch to glycolic acid.

Emission point	SCDHEC IDs	Description	Part of Process (Y/N)	Basis for exemption If not exempt - basis for emissions	Impact from Modification
SDJ0001	349S, 351S, 352S, 354S	Frit Transfer (Material Handling)	N	Raw material storage	None
SDP0001	176S	5800 GALLON SLUDGE TANK (5800 gallons)	Y	SRNS-J2210-2013-00050	None
SDP0001	177S	5800 GALLON RECYCLE TANK (5800 gallons)	Y	SRNS-J2210-2013-00050	None
SDP0001	178S	5800 GALLON PRECIPITATE TANK (5800 gallons)	Y	SRNS-J2210-2013-00050	None
SDP0007	275S	Precipitate Reactor Feed Tank	Y	WSRC-TR-95-0247	Yes
SDP0007	264S	Decontamination Waste Treatment Tank	Y	WSRC-TR-95-0247	Yes
SDP0007	256S	CDC-SME isolation pot	Y	WSRC-TR-95-0247	Yes
SDP0007	278S	Offgas Condensate Tank 1	Y	WSRC-TR-95-0247	Yes
SDP0007	488S	Offgas Condensate Tank 2	Y	WSRC-TR-95-0247	Yes
SDP0007	388S	Crane Decon Feed Tank	Y	WSRC-TR-95-0247	Yes
SDP0007	267S	Sludge Receipt Tank (SRAT)	Y	WSRC-TR-95-0247	Yes
SDP0007	266S	Slurry Mix Evaporator (SME)	Y	WSRC-TR-95-0247	Yes
SDP0007	270S	Melter	Y	WSRC-TR-95-0247	Yes
SDP0009	121S	90% FORMIC ACID FEED TANK, 600 GAL (600 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (formic acid)
SDP0009	111S	NITRIC ACID DILUTION TANK, 100 GAL (100 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for nitric acid
SDP0009	109S	NITRIC ACID DECON FEED TANK, 1100 GAL (1100 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for nitric acid and manganese

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

					compounds
SDP0009	108S	PROCESS FRIT SLURRY FEED TANK, 2800 GAL (2800 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (formic acid)
SDP0009	107S	FRIT DECON SLURRY FEED TANK (780 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (formic acid)
SDP0009	106S	COPPER CATALYST FEED TANK (180 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (PM)
SDP0009	105S	ADDITIVE MIX FEED TANK (180 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for VOC emissions
SDP0009	103S	221-S Vitrification Process Oxalic Decon Feed Tank (1100 gallons)	Y	SRNS-J2210-2013-00050	Yes, will be AIP
SDP0009	102S	ORGANIC ACID DRAIN TANK, 1200 GAL (1200 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (oxalic acid)
SDP0009	101S	SODIUM NITRITE FEED TANK, 600 GAL (600 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for PM emissions
SDP0009	100S	NITRIC ACID FEED TANK, 600 GAL (600 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for nitric acid
SDP0009	098S	ACID DRAIN CATCH TANK, 1200 GAL (1200 gallons)	Y	SRNS-J2210-2013-00050	No, SRNS-J2200-2019-00240 bounding for nitric acid
SDP0019	132S	OXALIC ACID MAKE UP TANK, 1300 GAL (1300 gallons)	Y	SRNS-J2210-2013-00050	Yes, will be AIP
SDP0019	131S	DILUTE FORMIC ACID FEED TANK, 2000 GAL (2000 gallons)	Y	SRNS-J2210-2013-00050	Yes, will be AIP
SDP0019	129S	FORMIC ACID DILUTION TANK, 2000 GAL (2000 gallons)	Y	SRNS-J2210-2013-00050	Yes, will be AIP
SDP0019	128S	FRIT SLURRY MAKE-UP TANK (2300 gallons)	Y	SRNS-J2210-2013-00050	Yes, will no longer emit regulated pollutant (formic acid)
SDP0067	286S	POTASSIUM NITRATE MAKE-UP TANK, 160	N	Raw material storage	No, SRNS-J2200-2021-00108 only

		GAL (160 gallons)			emits water
SDP0067	288S	CATALYST MAKE-UP TANK (550 gallons)	N	Raw material storage	Yes, will be AIP SRNS-J2200-2021-00108 only emits water
SDP0067	291S	NITRIC ACID DECON MAKE-UP TANK, 1300 GAL (1300 gallons)	N	Raw material storage	Yes, slight increase in nitric acid emissions
SDP0067	289S	SODIUM NITRITE MAKE-UP TANK, 540 GAL (540 gallons)	N	Raw material storage	No, SRNS-J2200-2021-00108 only emits water
SDP0067	293S	50% NITRIC ACID STORAGE TANK, 1000 GAL (1000 gallons)	N	Raw material storage	Yes, slight increase in nitric acid emissions
SDT0028	335S	NITRIC ACID WASTE HOLD TANK (2100 gallons)	N	Waste/Chemical Treatment	No, SRNS-J2210-2013-0050 bounding for nitric acid emissions
SDT0029	192S	8% NITRIC ACID MIX DAY TANK (375 gallons)	N	Waste/Chemical Treatment	No, SRNS-J2210-2013-0050 bounding for nitric acid emissions
SDT0035	079S	ORGANIC WASTE/NEUT TANK #1 (3150 gallons)	N	Waste/Chemical Treatment	Yes, will no longer emit regulated pollutant (formic acid)
SDT0036	020S	ORGANIC WASTE/NEUT TANK #2 (3150 gallons)	N	Waste/Chemical Treatment	Yes, will no longer emit regulated pollutant (formic acid)
SDT0043	298S	FORMIC ACID STORAGE TANK #2, 6500 GAL (6500 gallons)	N	Raw material storage	Yes, will no longer emit regulated pollutant (formic acid)
SDT0046	374S	FORMIC ACID STORAGE TANK #1, 6500 GAL (6500 gallons)	N	Raw material storage	Yes, will be AIP
SDT0047	407S	OXALIC ACID STORAGE TANK (6000 gallons)	N	Raw material storage	Yes, will be AIP

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

ASSUMPTIONS:

1. The DWPF is a "batch" designed process
2. One (1) batch of waste will result in an average of 5 canisters of glass (Q-ESR-S-00002)
3. Maximum annual capacity is 60 batches per year (300 canisters) (Q-ESR-S-0002)
4. The hourly glass production rate is 228 pounds per hour for an annual glass capacity of 60 cycles/year × 115 hours per cycle × 228 pounds per hour = 1,573,200 pounds per year.
5. Uncontrolled emissions from SDP0007 are from Reference 1 streams 39, 166, 185, 94, and 4. With the exception of emission rates of Carbon Monoxide, Carbon Dioxide, Oxalic Acid, Formic Acid, Nitric Acid, Nitrous Oxide, Nitric Oxide, Nitrogen Oxides, Volatile Organic Compounds (VOCs), Cobalt Glycolate, Magnesium Glycolate, and Nickel Glycolate. With the change to Glycolic Acid emissions of Formic Acid, Oxalic Acid, and VOCs will no longer occur at emission point SDP0007. Emission rates for Carbon Monoxide, Carbon Dioxide, Nitric Acid, Nitrous Oxide, Nitric Oxide, Nitrogen Oxides, Cobalt Glycolate, Magnesium Glycolate, and Nickel Glycolate are calculated under Q-ESR-S-00002 for emission point SDP0007.
5. SRAT batch process time is 86 hours (Q-ESR-S-00002).
6. SME batch process time is 86 hours (Q-ESR-S-00002).
7. Melter batch process time is 115 hours (Q-ESR-S-00002).
8. Emissions will occur from either the melter OG (Off Gas) or the melter BUOG (Back Up Off Gas) systems, but not both.
9. Trace emission evaluation is performed as described in SCDHEC Air Quality Modeling Guidelines dated October 2018 (Revised 4/15/2019). Trace determination is performed at the outlet of each stack, e.g. SDP0007 stack (controlled).
10. Mercury (Hg) and Mercury compounds were conservatively included as Particulate Matter.
11. Streams 39 and 4 contained in Reference 1 go through the formic acid vent condenser (FAVC).
12. The FAVC (J0005) has a capture efficiency of 100% and a 96% mercury removal rate.
13. The HEPA filter (N0001) is for radiological PM removal only and is not credited for non-radiological emissions control.
14. The composition of Group A and Group B components are located on page 43 of Choi, A.S., Lee, L.M., *Title V Projected Atmospheric Emissions From the Defense Waste Processing Facility,* WSRC-TR-95-00247, Rev. 0, Westinghouse Savannah River Company, January, 1996.
15. Conservatively assumed Particulate Matter PM2.5 equates PM10 and equates Total PM.
16. There are no control devices associated with SDP0001, SDP0009, and SDP0019.

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

CALCULATION:

Table 1 is the maximum uncontrolled emission in lb/hr for the streams pulled from Reference 1:

		WSRC-TR-95-0247 (Choi Stream)			39	166	185	94	4	
					Inlet vapor to FAVC	outlet from Decontamination Waste Treatement Tank	outlet from can decontamin taion chamber	melter	Precipitate Reactor Bottoms Tank to FAVC	Total Uncontrolled SDP7
CAS #				MW lb/lb-mol	flows (lb/hr)	flows (lb/hr)	flows (lb/hr)	flows (lb/hr)	flows (lb/hr)	flows (lb/hr)
7440-22-4	S	Silver	Ag	107.87	1.44E-17	0.00E+00	0.00E+00	0	0.00E+00	1.44E-17
20667-12-3	S	Silver Oxide	Ag2O	231.74	1.74E-24	2.02E-14	0.00E+00	0	0.00E+00	2.02E-14
90669-62-8	S	Aluminium oxide	Al2O3	101.96	3.08E-13	5.76E-19	0.00E+00	2.01E-04	0.00E+00	2.01E-04
1301-86-2	S	Boron oxide	B2O3	69.62	1.18E-13	2.20E-19	2.28E-07	3.29E-04	0.00E+00	3.29E-04
1304-28-5	S	Barium oxide	BaO	153.33	2.83E-21	0.00E+00	0.00E+00	3.19E-07	0.00E+00	3.19E-07
7727-43-7	S	Barium Sulfate	BaSO4	233.39	7.50E-15	1.40E-20	0.00E+00	4.37E-06	0.00E+00	4.37E-06
124-38-9	G	Carbon dioxide	CO2	44.01	8.50E+00	4.27E-01	0.00E+00	1.42E+01	6.13E-07	2.31E+01
	G		CO2 (C14)	-	6.33E-08	0.00E+00	0.00E+00	0	3.38E-17	6.33E-08
544-17-2	S	Calcium formate	Ca(COOH)2	130.11	9.27E-16	0.00E+00	0.00E+00	0	0.00E+00	9.27E-16
10124-37-5	S	Calcium nitrate	Ca(NO3)2	164.09	9.50E-14	1.78E-19	0.00E+00	0	0.00E+00	9.50E-14
7758-87-4	S	Tribasic Calcium phosphate	Ca3(PO4)2	310.18	8.16E-14	1.53E-19	0.00E+00	5.32E-05	0.00E+00	5.32E-05
563-72-4	S	Calcium oxalate	CaC2O4	128.1	1.66E-15	3.10E-21	0.00E+00	0	0.00E+00	1.66E-15
7789-75-5	S	Calcium fluoride	CaF2	97.07	4.97E-16	9.30E-22	0.00E+00	0	0.00E+00	4.97E-16
1305-78-8	S	Calcium oxide	CaO	56.08	1.52E-16	1.03E-21	0.00E+00	2.23E-05	0.00E+00	2.23E-05
7778-18-9	S	Calcium Sulfate	CaSO4	136.14	1.64E-15	3.06E-21	0.00E+00	9.59E-07	0.00E+00	9.59E-07
544-18-3	S	Cobalt formate	Co(COOH)2	148.97	4.11E-18	0.00E+00	0.00E+00	0	0.00E+00	4.11E-18
1307-96-6	S	Cobalt(II) oxide	CoO	74.93	8.61E-19	5.52E-24	0.00E+00	1.91E-09	0.00E+00	1.91E-09
1308-38-9	S	Chromium(III) oxide	Cr2O3	151.99	5.42E-15	1.02E-20	3.35E-10	3.55E-06	0.00E+00	3.55E-06
20281-00-9	S	Cesium oxide	Cs2O	281.81	4.91E-18	9.20E-24	0.00E+00	2.98E-06	0.00E+00	2.98E-06
3495-36-1	S	Cesium Formate	CsCOOH	177.92	6.46E-15	0.00E+00	0.00E+00	0	0.00E+00	6.46E-15
7789-18-6	S	Cesium nitrate	CsNO3	194.91	6.97E-19	1.31E-24	0.00E+00	0	0.00E+00	6.97E-19
21351-79-1	S	Cesium hydroxide	CsOH	149.91	3.13E-19	1.02E-20	0.00E+00	0	0.00E+00	3.23E-19
544-19-4	S	Copper formate	Cu(COOH)2	153.58	1.36E-16	0.00E+00	0.00E+00	0	0.00E+00	1.36E-16
3251-23-8	S	Copper nitrate	Cu(NO3)2	187.56	6.75E-14	1.26E-19	0.00E+00	0	0.00E+00	6.75E-14
1317-38-0	S	Copper oxide	CuO	79.55	6.01E-16	1.26E-21	0.00E+00	1.90E-05	0.00E+00	1.90E-05
1309-37-1	S	iron(III) oxide	Fe2O3	159.69	7.50E-13	1.43E-18	1.31E-10	4.89E-04	0.00E+00	4.89E-04
1345-25-1	S	iron(II) oxide	FeO	71.85	7.50E-14	1.40E-19	0.00E+00	4.89E-05	0.00E+00	4.89E-05
			Group A	-	6.55E-16	1.23E-21	0.00E+00	4.06E-07	0.00E+00	4.06E-07
			Group B	-	3.17E-15	5.93E-21	0.00E+00	2.07E-06	0.00E+00	2.07E-06
133-74-0	G	hydrogen	H2	2.02	3.14E-02	0.00E+00	0.00E+00	0	4.50E-25	3.14E-02
144-62-7	S	Oxalic acid	H2C2O4	90.04	4.57E-15	0.00E+00	0.00E+00	0	0.00E+00	4.57E-15
10043-35-3	L	Boric acid	H3BO3	61.83	2.40E-13	0.00E+00	0.00E+00	0	0.00E+00	2.40E-13
64-18-6	L	Formic acid	HCOOH	46.03	0	0.00E+00	0.00E+00	0	1.62E-02	1.62E-02
7664-39-3	L	hydrofluoric acid	HF	20.01	0	0.00E+00	0.00E+00	1.58E-03	0.00E+00	1.58E-03
7697-37-2	G	nitric acid	HNO3	63.01	1.15E+00	0.00E+00	0.00E+00	1.02E-02	0.00E+00	1.16E+00
7439-97-6	S	mercury	Hg	200.59	9.23E-02	0.00E+00	0.00E+00	2.12E-02	2.88E-08	2.49E-02
10054-94-0	S	mercury(II) nitrate	Hg(NO3)2	324.6	1.89E-10	0.00E+00	0.00E+00	0	0.00E+00	7.56E-12
10112-91-1	S	mercury(I) chloride	Hg2Cl2	472.09	0	0.00E+00	0.00E+00	1.98E-05	0.00E+00	1.98E-05
15385-57-6	S	mercury(I) iodide	Hg2I2	654.99	0	0.00E+00	0.00E+00	3.71E-10	0.00E+00	3.71E-10
7487-94-7	S	mercury(II) chloride	HgCl2	271.5	0	0.00E+00	0.00E+00	3.64E-16	0.00E+00	3.64E-16
21908-53-2	S	mercury(II) oxide	HgO	216.59	3.76E-19	8.82E-13	0.00E+00	0	0.00E+00	8.82E-13
7553-56-2	S	Iodine	I2	253.81	0	0.00E+00	0.00E+00	7.26E-10	0.00E+00	7.26E-10
12136-45-7	S	potassium oxide	K2O	94.2	4.77E-15	8.94E-21	0.00E+00	1.14E-04	0.00E+00	1.14E-04
590-29-4	S	potassium formate	KCOOH	84.12	3.05E-13	0.00E+00	0.00E+00	0	0.00E+00	3.05E-13
7757-79-1	S	potassium nitrate	KNO3	101.1	9.24E-16	1.73E-21	0.00E+00	0	0.00E+00	9.24E-16
1310-58-3	S	potassium hydroxide	KOH	56.11	1.95E-18	2.27E-08	0.00E+00	0	0.00E+00	2.27E-08
12057-24-8	S	lithium oxide	Li2O	29.88	1.03E-13	1.93E-19	2.00E-07	2.13E-04	0.00E+00	2.13E-04
557-39-1	S	magnesium formate	Mg(COOH)2	114.34	1.09E-13	0.00E+00	0.00E+00	0	0.00E+00	1.09E-13
1309-48-8	S	magnesium oxide	MgO	40.3	3.90E-14	1.45E-19	5.71E-08	9.20E-05	0.00E+00	9.21E-05
3251-96-5	S	manganese formate	Mn(COOH)2	144.98	7.88E-14	0.00E+00	0.00E+00	0	0.00E+00	7.88E-14
1317-34-6	S	manganese(II) oxide	MnO	70.94	5.39E-19	7.21E-20	0.00E+00	6.14E-05	0.00E+00	6.14E-05
1313-13-9	S	manganese dioxide	MnO2	86.94	6.82E-14	3.51E-08	0.00E+00	0	0.00E+00	3.51E-08
18868-43-4	S	molybdenum(IV) oxide	MoO2	127.94	4.60E-17	8.60E-23	0.00E+00	3.00E-08	0.00E+00	3.00E-08
7727-37-9	G	nitrogen	N2	28.01	1.33E+03	5.48E+01	5.17E+02	1.40E+03	5.48E+01	3.35E+03
1024-97-2	G	nitrous oxide	N2O	44.01	3.17E-19	0.00E+00	0.00E+00	0	3.16E-19	6.33E-19
7664-41-7	G	ammonia	NH3	17.03	1.09E-03	1.14E-16	0.00E+00	0	3.30E-07	1.09E-03
6484-52-2	S	ammonium nitrate	NH4NO3	80.04	9.38E-09	1.76E-14	0.00E+00	0	0.00E+00	9.38E-09
1336-21-6	G	ammonium hydroxide	NH4OH	35.05	0	2.87E-21	0.00E+00	0	0.00E+00	2.87E-21
10102-43-9	G	nitric oxide	NO	30.01	0	0.00E+00	0.00E+00	2.91E+00	3.38E-12	2.91E+00
10102-44-0	G	nitrogen dioxide	NO2	46.01	2.89E+00	1.98E-11	0.00E+00	5.83E+00	1.04E-20	8.72E+00
71377-02-1	S	sodium borate decahydrate	Na2B4O7	201.22	2.12E-18	3.66E-19	0.00E+00	0	0.00E+00	2.49E-18
62-76-0	S	sodium oxalate	Na2C2O4	134	1.41E-16	1.64E-06	0.00E+00	0	0.00E+00	1.64E-06
497-19-8	S	sodium carbonate	Na2CO3	105.99	1.40E-13	2.62E-19	0.00E+00	0	0.00E+00	1.40E-13
1313-59-3	S	disodium oxide	Na2O	61.98	1.71E-13	3.21E-19	1.52E-07	5.05E-04	0.00E+00	5.05E-04
7757-82-6	S	sodium sulfate	Na2SO4	142.04	9.54E-15	1.79E-20	0.00E+00	1.00E-05	0.00E+00	1.00E-05
7601-54-9	S	sodium phosphate	Na3PO4	163.94	2.40E-16	4.49E-22	0.00E+00	1.56E-07	0.00E+00	1.56E-07
141-53-7	S	sodium formate	NaCOOH	68.01	2.76E-14	9.06E-19	4.22E-08	0	0.00E+00	4.22E-08
7647-14-5	S	sodium chloride	NaCl	58.44	5.73E-16	1.07E-21	0.00E+00	1.86E-07	0.00E+00	1.86E-07
7681-49-4	S	sodium fluoride	NaF	41.99	1.18E-15	2.21E-21	0.00E+00	7.49E-07	0.00E+00	7.49E-07
7681-82-5	S	sodium iodide	NaI	149.89	2.63E-19	4.93E-25	0.00E+00	0	0.00E+00	2.63E-19
7632-00-0	S	sodium nitrite	NaNO2	68.99	1.80E-16	3.37E-22	0.00E+00	0	0.00E+00	1.80E-16
7631-99-4	S	sodium nitrate	NaNO3	84.99	8.10E-13	1.38E-06	0.00E+00	0	0.00E+00	1.38E-06
1310-73-2	S	sodium hydroxide	NaOH	40	0	8.18E-08	0.00E+00	0	0.00E+00	8.18E-08
3349-06-2	S	Nickel formate	Ni(COOH)2	148.73	1.14E-15	0.00E+00	0.00E+00	0	0.00E+00	1.14E-15
1313-99-1	S	Nickel oxide	NiO	74.69	8.71E-15	1.74E-20	1.35E-09	6.12E-06	0.00E+00	6.12E-06
7782-44-7	G	Oxygen	O2	32	4.00E+02	1.65E+01	1.56E+02	4.26E+02	1.66E+01	1.02E+03
10099-74-8	S	Lead(II) nitrate	Pb(NO3)2	331.21	1.50E-18	2.80E-24	0.00E+00	0	0.00E+00	1.50E-18
598-63-0	S	Lead carbonate	PbCO3	267.21	1.22E-17	2.28E-23	0.00E+00	0	0.00E+00	1.22E-17
1317-36-8	S	Lead oxide	PbO	223.2	8.02E-22	0.00E+00	0.00E+00	9.13E-08	0.00E+00	9.13E-08
7446-14-2	S	Lead sulfate	PbSO4	303.26	3.50E-15	6.55E-21	0.00E+00	2.17E-06	0.00E+00	2.17E-06
7440-05-3	S	Palladium	Pd	106.42	5.77E-19	0.00E+00	0.00E+00	0	0.00E+00	5.77E-19
1314-08-5	S	Palladium oxide	PdO	122.42	0	9.43E-16	0.00E+00	0	0.00E+00	9.43E-16
12059-95-9	S	Plutonium dioxide	PuO2	276	3.08E-16	5.76E-22	0.00E+00	2.03E-07	0.00E+00	2.03E-07
	S	Plutonium Oxide Disodium T	PuO2(NaTi2O	673.49	7.70E-18	1.44E-23	0.00E+00	0	0.00E+00	7.70E-18
7440-16-6	S	Rhodium	Rh	102.91	1.51E-18	0.00E+00	0.00E+00	0	0.00E+00	1.51E-18
12137-27-8	S	Rhodium dioxide	RhO2	134.9	2.43E-25	2.84E-15	0.00E+00	0	0.00E+00	2.84E-15
7440-18-8	S	Ruthenium	Ru	101.07	2.43E-16	4.54E-22	0.00E+00	0	0.00E+00	2.43E-16
7647-17-8		Cesium chloride	Semi Vol CsC	168.36	0	0.00E+00	0.00E+00	3.96E-04	0.00E+00	3.96E-04
			Semi Vol Grou	-	0	0.00E+00	0.00E+00	2.14E-05	0.00E+00	2.14E-05
71377-02-1		sodium borate decahydrate	Semi Vol Na2	201.22	0	0.00E+00	0.00E+00	2.39E-03	0.00E+00	2.39E-03
7681-49-4		sodium fluoride	Semi Vol NaF	41.99	0	0.00E+00	0.00E+00	2.77E-04	0.00E+00	2.77E-04
7681-82-5		sodium iodide	Semi Vol NaI	149.89	0	0.00E+00	0.00E+00	1.70E-07	0.00E+00	1.70E-07
7631-86-9	S	Silicon dioxide	SiO2	60.08	1.18E-12	2.22E-18	2.20E-06	2.37E-03	0.00E+00	2.38E-03
592-89-2	S	Strontium formate	Sr(COOH)2	177.66	1.22E-18	0.00E+00	0.00E+00	0	0.00E+00	1.22E-18
10042-76-9	S	Strontium nitrate	Sr(NO3)2	211.63	9.61E-16	1.80E-21	0.00E+00	0	0.00E+00	9.61E-16
	S	Strontium disodium titanate	Sr(NaTi2O5)2	485.11	2.17E-18	4.05E-24	0.00E+00	0	0.00E+00	2.17E-18
1314-11-0	S	Strontium oxide	SrO	103.62	2.70E-21	1.34E-24	0.00E+00	3.08E-07	0.00E+00	3.08E-07
12036-16-7	S	Technetium dioxide	TcO2	130	9.29E-17	1.74E-22	0.00E+00	8.79E-08	0.00E+00	8.79E-08
1314-20-1	S	Thorium dioxide	ThO2	264.04	3.69E-15	6.90E-21	0.00E+00	2.41E-06	0.00E+00	2.41E-06
13463-67-7	S	Titanium dioxide	TiO2	79.88	2.44E-14	4.57E-20	0.00E+00	1.58E-05	0.00E+00	1.58E-05
10028-17-8	G	tritium	Tritium	3	1.41E-10	1.56E-19	0.00E+00	3.93E-12	6.31E-15	1.45E-10
1317-99-3	S	triuranium octoxide	U3O8	842.08	7.58E-14	1.42E-19	0.00E+00	4.94E-05	0.00E+00	4.94E-05
16984-59-1	S	uranyl formate	UO2(COOH)2	360.06	2.25E-21	0.00E+00	0.00E+00	0	0.00E+00	2.25E-21
10102-06-4	S	uranyl nitrate	UO2(NO3)2	394.04	3.30E-18	6.18E-24	0.00E+00	0	0.00E+00	3.30E-18
15331-71-2	S	yttrium formate	Y(COOH)3	223.96	1.98E-19	0.00E+00	0.00E+00	0	0.00E+00	1.98E-19
13768-67-7	S	yttrium nitrate	Y(NO3)3	274.92	3.32E-16	6.22E-22	0.00E+00	0	0.00E+00	3.32E-16
1314-36-9	S	yttrium(III) oxide	Y2O3	225.81	4.42E-19	1.02E-24	0.00E+00	8.94E-08	0.00E+00	8.94E-08
	S		Zeolite	-	7.24E-16	1.36E-21	0.00E+00	0	0.00E+00	7.24E-16
557-41-5	S	zinc formate	Zn(COOH)2	155.43	1.94E-15	0.00E+00	0.00E+00	0	0.00E+00	1.94E-15
1314-13-2	S	zinc oxide	ZnO	81.39	2.32E-15	6.24E-21	0.00E+00	2.17E-06	0.00E+00	2.17E-06
	G		hydrate H2O	17.01	1.03E-13	1.71E-15	0.00E+00	0	0.00E+00	1.05E-13
7732-18-5	G	water	water	18.01	1.47E+02	1.22E+00	1.83E+01	2.64E+01	4.89E+00	1.97E+02

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 2 is the maximum lb/hr values for Carbon Monoxide, Carbon Dioxide, Nitric Acid, Nitrous Oxide, Nitric Oxide, Nitrogen Oxides, Cobalt Glycolate, Magnesium Glycolate, and Nickel Glycolate from Q-ESR-S-0002.

Chemical	Lb/hr (controlled and uncontrolled)
Carbon Monoxide (CO)	2.5
Carbon Dioxide (CO2)	83.1
Nitric Acid (HNO3)	0.017
Nitrous Oxide (N2O)	3.7
Nitric Oxide (NO)	0
Nitrogen Oxides (NOx as NO2)	24.9
Cobalt Glycolate	1.158E-15
Magnesium Glycolate	2.255E-11
Nickel Glycolate	3.219E-13

The only emission sources for the above chemicals at SDP0007 are accounted for at the SRAT, SME, and melter once glycolic acid is in use.

The following are pertinent excerpts from Q-ESR-S-0002 to support the values provided in the above table.

Carbon Monoxide

Carbon monoxide, CO, gasses off in the Melter at a rate of 2.5 lb/h.
The annual rate is,

$$2.5\ \frac{\text{lb}}{\text{h}}\left(115\ \frac{\text{h}}{\text{cycle}}\right)\left(60\ \frac{\text{cycle}}{\text{y}}\right) = 17{,}250\ \frac{\text{lb}}{\text{y}} \xrightarrow{\div 2{,}000\ \text{lb}/\text{ton}} 8.6\ \frac{\text{ton}}{\text{y}}$$

Carbon Dioxide

The concentration of carbon compounds in the sludge and the amount of glycolic acid added in the SRAT has a direct effect on the production of carbon dioxide, CO_2. For conservative purposes, the maximum potential emissions for CO_2 are based on 600 gallons of glycolic acid added to a processing cycle.

CARBON DIOXIDE FROM CARBONATE IN THE SRAT AND SME

Hourly

For the hourly emission rate Total Inorganic Carbon (TIC) = 1,400 mg/kg, which is based on dissolved sodium carbonate (Na_2CO_3, molar mass = 105.99 kg/kg-mole). For a SRAT volume of 7,500 gallons (28,391 L) for each processing cycle at a density of 1.16 kg/L, conversion to kg-mole is therefore,

$$1{,}400\ \frac{\text{mg}}{\text{kg}}\left(\frac{28{,}391\ \text{L}}{\text{cycle}}\right)\left(1.16\ \frac{\text{kg}}{\text{L}}\right)\left(\frac{\text{kg-mole}}{105.99\ \text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 0.435\ \frac{\text{kg-mole}}{\text{cycle}}$$

Carbon dioxide (molar mass = 44.01 kg/kg-mole) emitted from carbonate is,

$$0.435\ \frac{\text{kg-mole}}{\text{cycle}}\left(44.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{cycle}}{86\ \text{h}}\right) = 0.5\ \frac{\text{lb}}{\text{h}}$$

Annual

For the annual emission rate, TIC = 1,200 mg/kg, which is based on dissolved sodium carbonate (Na_2CO_3, molar mass = 105.99 kg/kg-mole). For a SRAT volume of 7,500 gallons (28,391 L) for each processing cycle at a density of 1.12 kg/L, conversion to kg-mole is therefore,

$$1{,}200\ \frac{\text{mg}}{\text{kg}}\left(\frac{28{,}391\ \text{L}}{\text{cycle}}\right)\left(1.12\ \frac{\text{kg}}{\text{L}}\right)\left(\frac{\text{kg-mole}}{105.99\ \text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 0.360\ \frac{\text{kg-mole}}{\text{cycle}}$$

Carbon dioxide (molar mass = 44.01 kg/kg-mole) emitted from carbonate is,

$$0.360\ \frac{\text{kg-mole}}{\text{cycle}}\left(44.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\frac{\text{lb}}{\text{kg}}\right)\left(60\ \frac{\text{cycle}}{\text{y}}\right) = 2{,}096\ \frac{\text{lb}}{\text{y}}$$

CARBON DIOXIDE FROM GLYCOLIC ACID IN THE SRAT AND SME

Chemical reactions in the SRAT and SME produce carbon dioxide from glycolic acid ($C_2H_4O_3$, molar mass = 76.05 kg/kg-mole) additions. For both the annual and hourly emission rate, each processing cycle uses 600 gallons (2,271 L) of glycolic acid for each operating cycle. The reaction combinations that produce 9 kilogram moles of CO_2 per 5 kilogram moles of glycolic acid produce the most CO_2. The CO_2 emissions from this set of reactions is,

$$2{,}271\ \frac{\text{L}}{\text{cycle}}\left(1.27\ \frac{\text{kg}}{\text{L}}\right)\left(\frac{\text{kg-mole}}{76.05\ \text{kg}}\right)\left(\frac{70}{100}\right) = 26.55\ \frac{\text{kg-mole } C_2H_4O_3}{\text{cycle}}$$

Hourly

The hourly emission rate is then,

$$26.55\ \frac{\text{kg-mole}}{\text{cycle}}\left(\frac{9\ \text{kg-mole}_{CO_2}}{5\ \text{kg-mole}_{C_2H_4O_3}}\right)\left(44.01\ \frac{\text{kg}_{CO_2}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{cycle}}{86\ \text{h}}\right) = 53.9\frac{\text{lb}}{\text{h}}$$

Annual

Similarly, the annual emission rate is,

$$26.55\ \frac{\text{kg-mole}}{\text{cycle}}\left(\frac{9\ \text{kg-mole}_{CO_2}}{5\ \text{kg-mole}_{C_2H_4O_3}}\right)\left(44.01\ \frac{\text{kg}_{CO_2}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(60\ \frac{\text{cycle}}{\text{y}}\right) = 278{,}260\ \frac{\text{lb}}{\text{y}}$$

TOTAL CARBON DIOXIDE FROM THE SRAT AND SME

The total CO_2 production in the SME and SRAT combined from both mechanisms is determined.

Hourly

$$0.5\ \frac{\text{lb}}{\text{h}} + 53.9\frac{\text{lb}}{\text{h}} = 54.4\frac{\text{lb}}{\text{h}}$$

Annual

$$2{,}096\ \frac{\text{lb}}{\text{y}} + 278{,}260\ \frac{\text{lb}}{\text{y}} = 280{,}356\ \frac{\text{lb}}{\text{y}} \xrightarrow{\div 2{,}000\ \text{lb}/\text{ton}} 140.2\ \frac{\text{ton}}{\text{y}}$$

CARBON DIOXIDE FROM BICARBONATE IN THE MELTER

The Melter receives a conservative concentration of 2,000 mg/kg of bicarbonate, HCO_3^-, for eventual off-gassing. Carbon dioxide, CO_2, is the off-gas product. This input addresses any absorption of carbon dioxide gas (forming the bicarbonate) into the frit slurry while awaiting feed to the Melter.

The bicarbonate anion (HCO_3^-, molar mass = 61.02 kg/kg-mole) is present in the feed to the Melter at a conservative concentration of 2,000 mg/kg for a 6,000-gallon cycle volume (22,712 L)

Hourly

The number of kilogram moles of bicarbonate present per operating cycle is,

$$0.002\ \frac{\text{kg}_{HCO_3^-}}{\text{kg}_{\text{sludge}}}\left(\frac{\text{kg-mole}_{HCO_3^-}}{61.02\ \text{kg}_{HCO_3^-}}\right)\left(1.16\ \frac{\text{kg}_{\text{sludge}}}{\text{L}}\right)\left(22{,}712\ \frac{\text{L}}{\text{cycle}}\right) = 0.864\ \frac{\text{kg-mole}}{\text{cycle}}$$

Every kilogram mole of bicarbonate produces one kilogram mole of CO_2, so the hourly emission rate of carbon dioxide from bicarbonate is,

$$0.864\ \frac{\text{kg-mole}}{\text{cycle}}\left(44.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{cycle}}{115\ \text{h}}\right) = 0.7\ \frac{\text{lb}}{\text{h}}$$

Annual

The number of kilogram moles of bicarbonate present per operating cycle for the annual emission is,

$$0.002\ \frac{kg_{HCO_3^-}}{kg_{sludge}}\left(\frac{\text{kg-mole}_{HCO_3^-}}{61.02\ kg_{HCO_3^-}}\right)\left(1.12\ \frac{kg_{sludge}}{L}\right)\left(22{,}712\ \frac{L}{cycle}\right) = 0.834\ \frac{\text{kg-mole}}{cycle}$$

The annual emission rate of carbon dioxide from bicarbonate is,

$$0.834\ \frac{\text{kg-mole}}{cycle}\left(44.01\ \frac{kg}{\text{kg-mole}}\right)\left(2.205\ \frac{lb}{kg}\right)\left(60\ \frac{cycle}{y}\right) = 4{,}855\ \frac{lb}{y} \xrightarrow{\div 2{,}000\ lb/ton} 2.4\ \frac{ton}{y}$$

CARBON DIOXIDE FROM CALCINE GASES IN THE MELTER

Glass production produces carbon dioxide in the Melter via calcination. The hourly off-gas rate of carbon dioxide is 28 lb/h.

Annual

The annual rate is,

$$28\ \frac{lb}{h}\left(115\ \frac{h}{cycle}\right)\left(60\ \frac{cycle}{y}\right) = 193{,}200\ \frac{lb}{y} \xrightarrow{\div 2{,}000\ lb/ton} 96.6\ \frac{ton}{y}$$

TOTAL CARBON DIOXIDE FROM THE MELTER

Hourly

The hourly emission rates for CO_2 in the Melter is then

$$0.7\ \frac{lb}{h} + 28.0\ \frac{lb}{h} = 28.7\ \frac{lb}{h}$$

Annual

The total annual emission rates for CO_2 in the Melter is then,

$$2.4\ \frac{ton}{y} + 96.6\ \frac{ton}{y} = 99.0\ \frac{ton}{y}$$

Hourly Maximum Potential Emissions for Carbon Dioxide

Summing the hourly CO_2 emissions from the SRAT, SME, and Melter,

$$49.0\ \frac{lb}{h}\ (SRAT) + 5.4\ \frac{lb}{h}\ (SME) + 28.7\ \frac{lb}{h}\ (Melter) = 83.1\ \frac{lb}{h}$$

Annual Maximum Potential Emissions for Carbon Dioxide

Summing the annual CO_2 emissions from the SRAT, SME, and Melter,

$$126.2\ \frac{ton}{y}\ (SRAT) + 14.0\ \frac{ton}{y}\ (SME) + 99.0\ \frac{ton}{y}\ (Melter) = 239.2\ \frac{ton}{y}$$

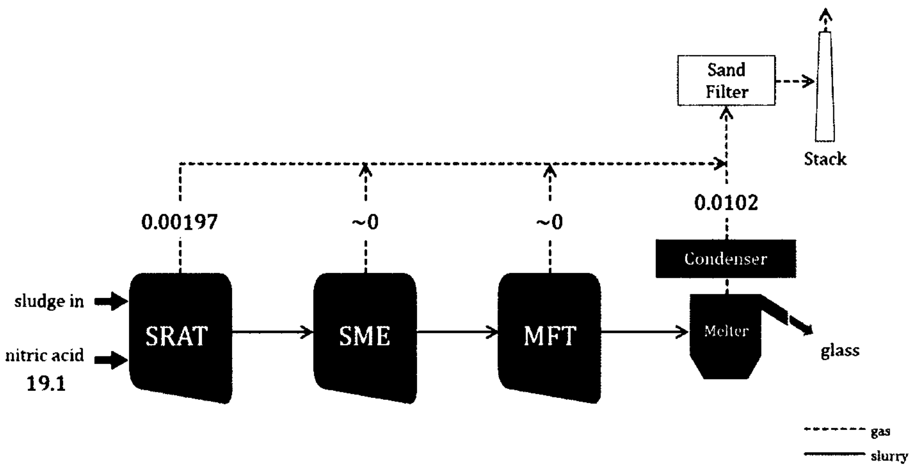
Nitric Acid Emissions

A change in reductant will not change the acid vapor entrainment ratios previously evaluated for formic acid, which coincide with the following stream values shown in the figure below (pounds per hour) for 300 gallons of nitric acid (the original acid baseline) introduced into the SRAT.

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid



Under the nitric-glycolic acid flowsheet, the SRAT receives 380 gallons of nitric acid for the annual emission estimate and 420 gallons for the hourly emission estimate.

ANNUAL EMISSIONS

For each cycle, the SRAT operates for 84 hours and the Melter operates for 115 hours. The nitric acid annual emissions are based on 60 cycles per year. Ratioing the flow rates accordingly (i.e., 380 gallons-to-300 gallons) reveals the new nitric acid annual maximum potential emissions,

SRAT – Nitric acid

$$\frac{380\ \text{gal}}{300\ \text{gal}}\left(0.00197\ \frac{\text{lb}}{\text{h}}\right)\left(86\ \frac{\text{h}}{\text{cycle}}\right)\left(60\ \frac{\text{cycle}}{\text{y}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right) = 0.006\ \frac{\text{ton}}{\text{y}}$$

Melter – Nitric acid

$$\frac{380\ \text{gal}}{300\ \text{gal}}\left(0.01020\ \frac{\text{lb}}{\text{h}}\right)\left(115\ \frac{\text{h}}{\text{cycle}}\right)\left(60\ \frac{\text{cycle}}{\text{y}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right) = 0.045\ \frac{\text{ton}}{\text{y}}$$

Annual maximum potential emissions for nitric acid

$$HNO_3\ (\text{annual}) = 0.006\ \frac{\text{ton}}{\text{y}} + 0.045\ \frac{\text{ton}}{\text{y}} = 0.05\ \frac{\text{ton}}{\text{y}}$$

HOURLY EMISSIONS

Similarly, the hourly maximum potential emissions,

SRAT – Nitric acid

$$\frac{420\ \text{gal}}{300\ \text{gal}}\left(0.00197\ \frac{\text{lb}}{\text{h}}\right) = 0.0028\ \frac{\text{lb}}{\text{h}}$$

Melter – Nitric acid

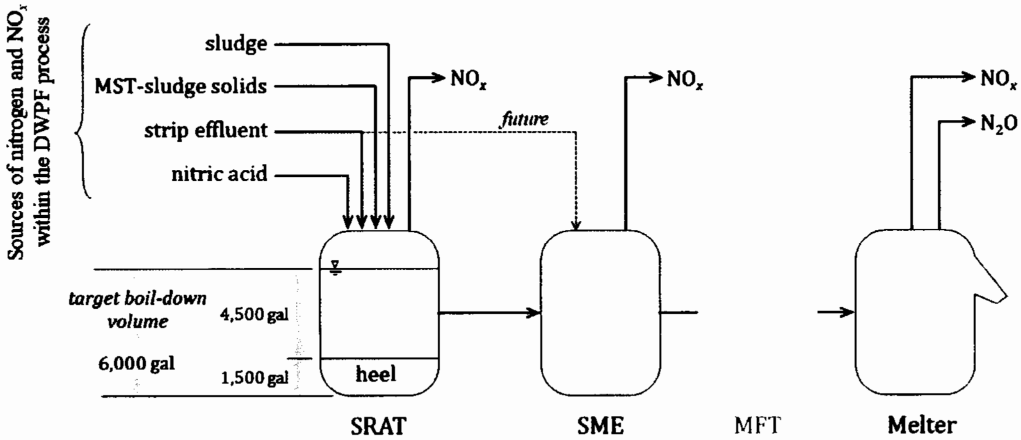
$$\frac{420\ \text{gal}}{300\ \text{gal}}\left(0.01020\ \frac{\text{lb}}{\text{h}}\right) = 0.0143\ \frac{\text{lb}}{\text{h}}$$

Hourly maximum potential emissions nitric acid

$$HNO_3\ (\text{hourly}) = 0.0028\ \frac{\text{lb}}{\text{h}} + 0.0143\ \frac{\text{lb}}{\text{h}} = 0.017\ \frac{\text{lb}}{\text{h}}$$

Nitrogen Oxide (NOx) Emissions

The nitric-glycolic acid flowsheet will use more nitric acid for each sludge processing cycle than the nitric-formic acid flowsheet and will therefore change the oxides of nitrogen emissions. NO_x originates from nitrogen sources in the 1) sludge, 2) MST-sludge solids, 3) strip effluent, and 4) nitric acid. A simple nitrogen balance on the process shown in figure below presents the conservative permitting basis for NO_x emissions.



NO_x and N2O EMISSION BASIS

The following inputs apply for the NO_x emission analysis,

1. Nitrogen sources in the sludge are from nitrite, NO_2-, and nitrate, NO_3-, anions. Concentrations of other nitrogen compounds, such as ammonia, NH_3, are small and considered negligible.
2. Nitrogen sources in the MST-sludge solids are from nitrite, NO_2-, and nitrate, NO_3-, anions. The composition is based on a review of historical processing data for this stream (from both ARP-MCU and SWPF), which shows the mean nitrite concentration to be less than 0.05 mol/L and the nitrate concentration to be approximately 0.1 mol/L. To include the possible wide variations in this stream, the nitrite concentration is doubled to 0.1 mol/L and the nitrate concentration is doubled to 0.2 mol/L.
3. Nitrogen sources in strip effluent is from the nitrate, NO_3-, anion. The sample results for sodium concentration forms the basis for the mass of nitrogen in the strip effluent. To account for uncertainty, all of the sodium is assigned to the nitrate anion, NO_3-, and a threefold standard deviation, 3σ, allowance is added to the arithmetic mean, μ, which yields a concentration of 195 mg/L.
4. Nitrogen compounds entering DWPF converts to NO_x gas (as nitrogen dioxide, NO_2) in the following manner,

a. 30 % entering the SRAT. This is based on historical processing data.
b. 5 % entering the SME.
c. 75 % entering the Melter

5. The pre-boil down volume of sludge is 7,500 gallons per processing cycle.
6. The SRAT boils down the sludge, MST-sludge solids, and strip effluent to 6,000 gallons for a transfer volume of 4,500 gallons to the SME.
7. For conservative purposes, the nitric acid solution added for each processing cycle,

a. the estimate for the annual maximum potential emission assumes 380 gallons.
b. the estimate for the hourly maximum potential emission assumes 420 gallons.

8. The ammonia scrubber, the SRAT condenser, or the SME condenser do not convert nitrogen dioxide gas, NO_2, to nitric acid.

ANNUAL EMISSIONS

SRAT – Nitrogen from sludge

From Input 4.a, the concentration for nitrite, NO_2-, is 9,000 mg/kg and for nitrate, NO_3-, 10,000 mg/kg. Let the starting sludge volume for a single operating cycle be 7,500 gallons (28,391 L) at a density of 1.12 kg/L (pre-boil down). The mass, *m* (kg), for each anion is therefore,

$$m_{\text{sludge}} = 28{,}391\frac{\text{L}}{\text{cycle}}\left(1.12\ \frac{\text{kg}}{\text{L}}\right) = 31{,}797\frac{\text{kg}}{\text{cycle}}$$

$$m_{NO_2^-} = 31{,}797\frac{\text{kg}}{\text{cycle}}\left(9{,}000\ \frac{\text{mg}}{\text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 286.18\ \frac{\text{kg}}{\text{cycle}}$$

$$m_{NO_3^-} = 31{,}797\frac{\text{kg}}{\text{cycle}}\left(10{,}000\ \frac{\text{mg}}{\text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 317.97\ \frac{\text{kg}}{\text{cycle}}$$

Using the molar mass conversions from Input 5, the mass in kilogram moles, *n*, is,

$$n_{NO_2^-} = 286.18\frac{\text{kg}}{\text{cycle}}\left(\frac{\text{kg-mole}}{46.01\ \text{kg}}\right) = 6.22\ \frac{\text{kg-mole}}{\text{cycle}}$$

$$n_{NO_3^-} = 317.97\frac{\text{kg}}{\text{cycle}}\left(\frac{\text{kg-mole}}{62.01\ \text{kg}}\right) = 5.13\ \frac{\text{kg-mole}}{\text{cycle}}$$

The nitrogen total from sludge, $n_{N,\text{ sludge}}$, is $6.22\frac{\text{kg-mole}}{\text{cycle}} + 5.13\frac{\text{kg-mole}}{\text{cycle}} = 11.35\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – Nitrogen from MST-sludge solids

The concentration for nitrite, NO_2^-, is 0.1 mol/L and for nitrate, NO_3^-, 0.2 mol/L. The volume of the MST-sludge solids receipt into the SRAT is 3,000 gallons (11,356 L) for a single operating cycle. The mass, *n* (kg-mole), for each anion is therefore,

$$n_{NO_2^-} = 0.1\ \frac{\text{mol}}{\text{L}}\left(11{,}356\frac{\text{L}}{\text{cycle}}\right)\left(\frac{\text{kg-mole}}{1{,}000\ \text{mol}}\right) = 1.14\ \frac{\text{kg-mole}}{\text{cycle}}$$

$$n_{NO_3^-} = 0.2\ \frac{\text{mol}}{\text{L}}\left(11{,}356\frac{\text{L}}{\text{cycle}}\right)\left(\frac{\text{kg-mole}}{1{,}000\ \text{mol}}\right) = 2.27\ \frac{\text{kg-mole}}{\text{cycle}}$$

The nitrogen total, $n_{N,\text{ MST-sludge solids}}$, is $1.14\frac{\text{kg-mole}}{\text{cycle}} + 2.27\frac{\text{kg-mole}}{\text{cycle}} = 3.41\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – Nitrogen from strip effluent

The concentration for the nitrogen compounds in the strip effluent is the concentration of sodium (at a 1:1 stoichiometry). The kg-moles of sodium, nn_{Na+}, yields the mass (kg-mole) of nitrogen. For each processing cycle, the SRAT receives 15,000 gallons (56,781 L) of strip effluent.

$$n_{Na^+} = 195\ \frac{\text{mg}}{\text{L}}\left(56{,}781\frac{\text{L}}{\text{cycle}}\right)\left(\frac{\text{kg-mole}}{22.99\ \text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 0.48\ \frac{\text{kg-mole}}{\text{cycle}}$$

The total mass of nitrogen from the strip effluent, $n_{N,\text{ strip effluent}}$, is therefore $0.48\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – Nitrogen from nitric acid

For each processing cycle, the SRAT receives 380 gallons (1,438 L) of nitric acid, HNO_3. The solution is a 50 wt % aqueous solution with a density of 1.31 kg/L. The molar mass of nitric acid resolves the mass of nitrogen, *n* (kg-mole).

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

$$n_{HNO_3} = 1{,}438 \frac{\text{L}}{\text{cycle}} \left(1.31 \frac{\text{kg}}{\text{L}}\right)\left(\frac{50}{100}\right)\left(\frac{\text{kg-mole}}{63.01\ \text{kg}}\right) = 14.95 \frac{\text{kg-mole}}{\text{cycle}}$$

The total mass of nitrogen from nitric acid, $n_{N,\text{ nitric acid}}$, is therefore 14.95 $\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT - NO_x emission

The total mass, *n* (kg-mole), of nitrogen in the SRAT before off-gassing is,

$$n_{N,\text{ SRAT}_{start}} = n_{N,\text{ sludge}} + n_{N,\text{ MST-sludge solids}} + n_{N,\text{ strip effluent}} + n_{N,\text{ nitric acid}}$$

$$= (11.35 + 3.41 + 0.48 + 14.95) \frac{\text{kg-mole}}{\text{cycle}}$$

$$= 30.19 \frac{\text{kg-mole}}{\text{cycle}}$$

From historical sample data, 30 % of the nitrogen entering the SRAT gasses off, as nitrogen dioxide, NO_2, tracked as NO_x.

$$n_{NO_x,\text{ SRAT}} = \frac{30}{100}\left(30.19 \frac{\text{kg-mole}}{\text{cycle}}\right) = 9.06 \frac{\text{kg-mole}}{\text{cycle}}$$

Annually, at 60 cycles per year, the SRAT NO_x emission in tons per year (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\text{ SRAT}} = 9.06 \frac{\text{kg-mole}}{\text{cycle}}\left(60 \frac{\text{cycle}}{\text{y}}\right)\left(46.01 \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205 \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right)$$

$$n_{NO_x,\text{ SRAT}} = 27.6 \frac{\text{ton}}{\text{y}}$$

SME - NO_x emission

The total mass, *n* (kg-mole), of nitrogen remaining in the SRAT after off-gassing is,

$$n_{N,\text{ SRAT}_{end}} = n_{N,\text{ SRAT}_{start}} - n_{NO_x,\text{ SRAT}}$$

$$n_{N,\text{ SRAT}_{end}} = 30.19 \frac{\text{kg-mole}}{\text{cycle}} - 9.06 \frac{\text{kg-mole}}{\text{cycle}} = 21.13 \frac{\text{kg-mole}}{\text{cycle}}$$

The SRAT volume boils down to 6,000 gallons. The SME receives 4,500 gallons of the slurry (6,000 gallons minus the 1,500-gallon heel),

$$n_{N,\text{ SME}_{start}} = \frac{4{,}500\ \text{gal}}{6{,}000\ \text{gal}}\left(21.13 \frac{\text{kg-mole}}{\text{cycle}}\right) = 15.85 \frac{\text{kg-mole}}{\text{cycle}}$$

Part of the nitrogen in the SME gasses off at a rate of 5 % of the contents.

$$n_{NO_x,\text{ SME}} = \frac{5}{100}\left(15.85 \frac{\text{kg-mole}}{\text{cycle}}\right) = 0.79 \frac{\text{kg-mole}}{\text{cycle}}$$

Annually, at 60 cycles per year, the SME NO_x emission in tons per year (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\text{ SME}} = 0.79 \frac{\text{kg-mole}}{\text{cycle}}\left(60 \frac{\text{cycle}}{\text{y}}\right)\left(46.01 \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205 \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right)$$

$$n_{NO_x,\text{ SME}} = 2.4 \frac{\text{ton}}{\text{y}}$$

Melter - NO_x and N_2O emissions

The Melter receives (via the MFT) the nitrogen not gassed off as NO_x in the SRAT and SME.

$$n_{N,\,SME_{end}} = n_{N,\,Melter_{start}} = 15.85\ \frac{\text{kg-mole}}{\text{cycle}} - 0.79\ \frac{\text{kg-mole}}{\text{cycle}} = 15.06\ \frac{\text{kg-mole}}{\text{cycle}}$$

A substantial part, 75 %, of the nitrogen that reaches the Melter gasses off as nitrogen dioxide, NO_2 or NO_x, based on projections by the Savannah River National Laboratory. The remaining gasses off as nitrous oxide, N_2O, or nitrogen, N_2, and accounted as greenhouse gases.

$$n_{NO_x,\,Melter} = \frac{75}{100}\left(15.06\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 11.29\ \frac{\text{kg-mole}}{\text{cycle}}$$

$$n_{N_2O,\,Melter} = \frac{25}{100}\left(15.06\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 3.76\ \frac{\text{kg-mole}}{\text{cycle}}$$

Annually, at 60 cycles per year, the Melter NO_x emission in tons per year (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\,Melter} = 11.29\ \frac{\text{kg-mole}}{\text{cycle}}\left(60\ \frac{\text{cycle}}{\text{y}}\right)\left(46.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right)$$

$$n_{NO_x,\,Melter} = 34.4\ \frac{\text{ton}}{\text{y}}$$

Annual Maximum Potential Emissions for NO_x

The total NO_x emission for each processing cycle is,

$$n_{NO_x,\,\text{total per cycle}} = n_{NO_x,\,SRAT} + n_{NO_x,\,SME} + n_{NO_x,\,Melter}$$

$$n_{NO_x,\,\text{total per cycle}} = (\ 9.06 + 0.79 + 11.29\ )\frac{\text{kg-mole}}{\text{cycle}} = 21.14\ \frac{\text{kg-mole}}{\text{cycle}}$$

The following computation conservatively estimates the annual maximum potential emissions for NO_x at 60 cycles per year using the molar mass for nitrogen dioxide, NO_2,

$$NO_x(\text{annual}) = 21.14\ \frac{\text{kg-mole}}{\text{cycle}}\left(60\ \frac{\text{cycle}}{\text{y}}\right)\left(46.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)$$

$$= 64.3\ \frac{\text{ton}}{\text{y}}$$

Hence, the annual nitrous oxide emission is,

$$N_2O(\text{annual}) = 3.76\ \frac{\text{kg-mole}}{\text{cycle}}\left(60\ \frac{\text{cycle}}{\text{y}}\right)\left(44.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)\left(\frac{\text{ton}}{2{,}000\ \text{lb}}\right)$$

$$= 11.0\ \frac{\text{ton}}{\text{y}}$$

HOURLY EMISSIONS

An off-normal cycle covers the hourly maximum potential emissions for NO_x; characterized by a particularly difficult sludge receipt. The parameters used in the hourly computation is the same as the annual except for the following,

- The sludge nitrite concentration boosts to 10,500 mg/kg
- The sludge nitrate concentration boosts to 13,000 mg/kg
- The sludge density thickens to 1.16 kg/L
- The nitric acid volume increases to 420 gallons

SRAT – Nitrogen from sludge

The starting sludge volume stays the same at 7,500 gallons (28,391 L) for an operating cycle. The mass, *m* (kg), for each anion is therefore,

$$m_{\text{sludge}} = 28{,}391\frac{\text{L}}{\text{cycle}}\left(1.16\ \frac{\text{kg}}{\text{L}}\right) = 32{,}933\frac{\text{kg}}{\text{cycle}}$$

$$m_{\text{NO}_2^-} = 32{,}933\frac{\text{kg}}{\text{cycle}}\left(10{,}500\ \frac{\text{mg}}{\text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 345.80\ \frac{\text{kg}}{\text{cycle}}$$

$$m_{\text{NO}_3^-} = 32{,}933\frac{\text{kg}}{\text{cycle}}\left(13{,}000\ \frac{\text{mg}}{\text{kg}}\right)\left(\frac{\text{kg}}{1{,}000{,}000\ \text{mg}}\right) = 428.13\ \frac{\text{kg}}{\text{cycle}}$$

Using the molar mass conversions in Input 5, the mass in kilogram moles, n, is,

$$n_{\text{NO}_2^-} = 345.80\frac{\text{kg}}{\text{cycle}}\left(\frac{\text{kg-mole}}{46.01\ \text{kg}}\right) = 7.52\ \frac{\text{kg-mole}}{\text{cycle}}$$

$$n_{\text{NO}_3^-} = 428.13\frac{\text{kg}}{\text{cycle}}\left(\frac{\text{kg-mole}}{62.01\ \text{kg}}\right) = 6.90\ \frac{\text{kg-mole}}{\text{cycle}}$$

The total mass of nitrogen from sludge, $n_{\text{N, sludge}}$, is $7.52\ \frac{\text{kg-mole}}{\text{cycle}} + 6.90\ \frac{\text{kg-mole}}{\text{cycle}} = 14.42\ \frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – Nitrogen from nitric acid

The SRAT receives 420 gallons (1,590 L) of nitric acid, HNO_3, for each operating cycle for calculating the hourly maximum potential emissions for NO_x. The mass of acid, n (kg-mole) per cycle is,

$$n_{\text{HNO}_3} = 1{,}590\frac{\text{L}}{\text{cycle}}\left(1.31\ \frac{\text{kg}}{\text{L}}\right)\left(\frac{50}{100}\right)\left(\frac{\text{kg-mole}}{63.01\ \text{kg}}\right) = 16.53\ \frac{\text{kg-mole}}{\text{cycle}}$$

Consequently, the total mass of nitrogen from nitric acid, $n_{\text{N, nitric acid}}$, for the hourly computation is therefore 16.53 $\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – NO_x emission

The total mass, n (kg-mole), of nitrogen in the SRAT before off-gassing is,

$$n_{\text{HNO}_3} = 1{,}590\frac{\text{L}}{\text{cycle}}\left(1.31\ \frac{\text{kg}}{\text{L}}\right)\left(\frac{50}{100}\right)\left(\frac{\text{kg-mole}}{63.01\ \text{kg}}\right) = 16.53\ \frac{\text{kg-mole}}{\text{cycle}}$$

Consequently, the total mass of nitrogen from nitric acid, $n_{\text{N, nitric acid}}$, for the hourly computation is therefore 16.53 $\frac{\text{kg-mole}}{\text{cycle}}$.

SRAT – NO_x emission

The total mass, n (kg-mole), of nitrogen in the SRAT before off-gassing is,

$$n_{\text{N, SRAT}_{start}} = n_{\text{N, sludge}} + n_{\text{N, MST-sludge solids}} + n_{\text{N, strip effluent}} + n_{\text{N, nitric acid}}$$

$$= (14.42 + 3.41 + 0.48 + 16.53)\frac{\text{kg-mole}}{\text{cycle}}$$

$$= 34.84\ \frac{\text{kg-mole}}{\text{cycle}}$$

The NO_x emission from the SRAT is likewise,

$$n_{\text{NO}_x,\text{SRAT}} = \frac{30}{100}\left(34.84\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 10.45\ \frac{\text{kg-mole}}{\text{cycle}}$$

At 86 hours per cycle, the SRAT NO_x emission in pounds per hour (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\,SRAT} = 10.45\ \frac{\text{kg-mole}}{\text{cycle}}\left(\frac{\text{cycle}}{86\ \text{h}}\right)\left(46.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)$$

$$n_{NO_x,\,SRAT} = 12.3\ \frac{\text{lb}}{\text{h}}$$

SME – NO_x emission

The total mass, *n* (kg-mole), of nitrogen in the SRAT after off-gassing is,

$$n_{N,\,SRAT_{end}} = n_{N,\,SRAT_{start}} - n_{NO_x,\,SRAT}$$

$$n_{N,\,SRAT_{end}} = 34.84\ \frac{\text{kg-mole}}{\text{cycle}} - 10.45\ \frac{\text{kg-mole}}{\text{cycle}} = 24.39\ \frac{\text{kg-mole}}{\text{cycle}}$$

The remaining nitrogen moved to the SME,

$$n_{N,\,SME_{start}} = \frac{4{,}500\ \text{gal}}{6{,}000\ \text{gal}}\left(24.39\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 18.29\ \frac{\text{kg-mole}}{\text{cycle}}$$

A part of the nitrogen in the SME gasses off at a rate of 5 % of the contents.

$$n_{NO_x,\,SME} = \frac{5}{100}\left(18.29\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 0.91\ \frac{\text{kg-mole}}{\text{cycle}}$$

At 86 hours per cycle, the SME NO_x emission in pounds per hour (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\,SME} = 0.91\ \frac{\text{kg-mole}}{\text{cycle}}\left(\frac{\text{cycle}}{86\ \text{h}}\right)\left(46.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)$$

$$n_{NO_x,\,SME} = 1.1\ \frac{\text{lb}}{\text{h}}$$

Melter – NO_x and N_2O emissions

The Melter receives (via the MFT) the nitrogen not gassed off as NO_x in the SRAT and SME.

$$n_{N,\,SME_{end}} = n_{N,\,Melter_{start}} = 18.29\ \frac{\text{kg-mole}}{\text{cycle}} - 0.91\ \frac{\text{kg-mole}}{\text{cycle}} = 17.37\ \frac{\text{kg-mole}}{\text{cycle}}$$

As for the annual computation, 75 %, of the nitrogen that reaches the Melter gasses off as nitrogen dioxide, NO_2 or NO_x for the hourly computation. The remaining gasses off as nitrous oxide, N_2O, or nitrogen, N_2, and accounted as greenhouse gases.

$$n_{NO_x,\,Melter} = \frac{75}{100}\left(17.37\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 13.03\ \frac{\text{kg-mole}}{\text{cycle}}$$

$$n_{N_2O,\,Melter} = \frac{25}{100}\left(17.37\ \frac{\text{kg-mole}}{\text{cycle}}\right) = 4.34\ \frac{\text{kg-mole}}{\text{cycle}}$$

At 115 hours per cycle, the Melter NO_x emission in pounds per hour (using NO_2 as the NO_x pollutant with a molar mass of 46.01 kg/kg-mole),

$$n_{NO_x,\,Melter} = 13.03\ \frac{\text{kg-mole}}{\text{cycle}}\left(\frac{\text{cycle}}{115\ \text{h}}\right)\left(46.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)$$

$$n_{NO_x,\,Melter} = 11.5\ \frac{\text{lb}}{\text{h}}$$

Hourly Maximum Potential Emissions for NO_x

The total hourly emissions from the SRAT, SME, and Melter are thus,

$$NO_x\text{(hourly)} = n_{NO_x,\text{SRAT}} + n_{NO_x,\text{SME}} + n_{NO_x,\text{Melter}}$$

$$= 12.3\ \frac{\text{lb}}{\text{h}} + 1.1\ \frac{\text{lb}}{\text{h}} + 11.5\ \frac{\text{lb}}{\text{h}} = 24.9\ \frac{\text{lb}}{\text{h}}$$

Also, the hourly nitrous oxide emission is,

$$N_2O\text{(hourly)} = 4.34\ \frac{\text{kg-mole}}{\text{cycle}} \left(\frac{\text{cycle}}{115\ \text{h}}\right)\left(44.01\ \frac{\text{kg}}{\text{kg-mole}}\right)\left(2.205\ \frac{\text{lb}}{\text{kg}}\right)$$

$$= 3.7\ \text{lb/h}$$

Glycolate metal Emissions

The source of the metals emitted from DWPF is from the processed salt solution and sludge. The reducing agent does not contribute to the metal emissions. Also, the cycle time and the number of cycles per year are the same as for formic acid. The only change in the emissions of the metals is that the metal-formates would be present as metal-glycolate.

Mercury emissions are a function of salt and sludge composition; therefore, mercury emissions for the nitric-glycolic acid flowsheet will be the same as the nitric-formic acid flowsheet.

Hourly

Multiplying each existing metal-formate emission rate by the ratio of the molar mass of the metalglycolate to that of the metal formate calculates the emissions of metal-glycolates.

Example: converting the cobalt formate hourly emission rate to cobalt glycolate in the SME,

$$\left(1.463\text{E-}16\ \frac{\text{lb}}{\text{h}}\ \text{cobalt formate}\right)\left(\frac{209.02}{148.97}\right) = \left(2.053\text{E-}16\ \frac{\text{lb}}{\text{h}}\ \text{cobalt glycolate}\right)$$

The following table shows the original formate hourly rate and the metal-glycolate conversion result.

CAS Registry Number	Pollutant	Molar Mass	SRAT (lb/h)	SME (lb/h)	Melter (lb/h)	Total (lb/h)
544-18-3	*Cobalt formate*	*148.97*	*6.789E-16*	*1.463E-16*	*0.000E+00*	*8.252E-16*
26656-81-5	Cobalt glycolate	209.02	9.526E-16	2.053E-16	0.000E+00	1.158E-15
3251-96-5	*Manganese formate*	*144.97*	*1.312E-11*	*2.826E-12*	*0.000E+00*	*1.595E-11*
not registered	Manganese glycolate	205.02	1.856E-11	3.997E-12	0.000E+00	2.255E-11
3349-06-2	*Nickel formate*	*148.73*	*1.887E-13*	*4.065E-14*	*0.000E+00*	*2.294E-13*
41587-84-2	Nickel glycolate	208.75	2.649E-13	5.707E-14	0.000E+00	3.219E-13
	Total glycolates		1.882E-11	4.054E-12	0.000E+00	2.287E-11

Annual

The annual rate (tons per year, tpy) is determined by multiplying each glycolate entry by cycle time (86 h) × annual cycle rate (60) × ton/2,000 lb = 2.58 ton-h/lb-y

The result for each metal-glycolate is included in the following table for the annual rate.

Table 4-2 Metal-glycolates air emission rates (annual)

Pollutant	SRAT (tpy)	SME (tpy)	Melter (tpy)	Total (tpy)
Cobalt glycolate	2.458E-15	5.296E-16	0.000E+00	2.987E-15
Manganese glycolate	4.787E-11	1.031E-11	0.000E+00	5.818E-11
Nickel glycolate	6.833E-13	1.472E-13	0.000E+00	8.305E-13
Total metal glycolates	4.856E-11	1.046E-11	0.000E+00	5.902E-11

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 3 presents all the regulated pollutants being emitted from SDP0007 (pollutants that meet definition of trace are not included)

				Goes to FAVC			melter	Goes to FAVC									
				SRAT limited	SRAT limited	melter limited	limited	SRAT limited	Uncontrolled								
	WSRC-TR-95-00247 (Choi Stream)			39	166	185	94	4			Controlled						
				Inlet vapor to FAVC	outlet from Decontamination Waste Treatement Tank	outlet from can decontamintaion chamber	melter	Precipitate Reactor Bottoms Tank to FAVC	Total Uncontrolled SDP7 (lb/hr)	Total Uncontrolled SDP7	Total SDP7	Total SDP7	wt % to determine trace		Carcinogen (Y/N)	Trace?	
CAS #			MW lb/lb-mol	flows (lb/hr)	flows (lb/hr)	flows (lb/hr)	flows (lb/h	flows (lb/hr)	(lb/hr)	(TPY)	(lb/hr)	(TPY)					
630-08-0	Carbon monoxide	CO	28.01						2.50E+00	8.60E+00	2.50E+00	8.60E+00				NA	Q-ESR-S-00002 rev 1
124-38-9	Carbon dioxide (GHG)	CO2	44.01	8.50E+00	4.27E-01	0.00E+00	1.42E+01	6.13E-07	8.31E+01	2.39E+02	8.31E+01	2.39E+02	NA			NA	Q-ESR-S-00002 rev 1
1024-97-2	Nitrous Oxide	N2O	44.01						3.70E+00	1.10E+01	3.70E+00	1.10E+01	13.05			NA	Q-ESR-S-00002 rev 1
10102-44-0	Nitrogen oxides (NO2) [MW=46.01]	NOx	46.01						2.49E+01	6.43E+01	2.49E+01	6.43E+01	76.29			NA	Q-ESR-S-00002 rev 1
	Total Particulate			9.23E-02	3.16E-06	2.88E-06	2.59E-02	2.88E-08	1.18E-01	3.28E-01	1.18E-01	3.28E-01	NA	Criteria		NA	
	PM-10			9.23E-02	3.16E-06	2.88E-06	2.59E-02	2.88E-08	1.18E-01	3.28E-01	1.18E-01	3.28E-01	NA	Criteria		NA	
	PM-2.5			9.23E-02	3.16E-06	2.88E-06	2.59E-02	2.88E-08	1.18E-01	3.28E-01	1.18E-01	3.28E-01	NA	Criteria		NA	
	Lead compounds (PbO)			2.59E-15	4.84E-21	0.00E+00	1.69E-06	0.00E+00	1.69E-06	5.82E-06	1.69E-06	5.82E-06	0.00	Standard 2 (Pb)	NA	NA	

If an "S" is in the second column of table 1, the constituent was included in PM emissions.
The total emissions used as the basis to determine trace emissions is:
CO + Hydrofluoric Acid + HNO3 + N2O + ammonia + ammonia hydroxide + NOx (as NO2) + Total PM
8.6 TPY + 5.43E-03 TPY + 5.00E-02 TPY + 11 TPY + 2.81E-03 TPY + 7.40E-21 TPY + 64.3 TPY + 3.28E-01 TPY = 84.3 TPY Controlled

Example Calculation for Nickel Compounds (NiO)
[(8.31E-13 TPY Nickel Glycolate) (1 mole Nickel Glycolate/208.75g) + (2.11E-05 TPY Nickel Oxide) (1 mole Nickel Oxide/74.69g)](74.69 g/1 mole NiO) = 2.11E-05 TPY NiO
(2.11E-05 TPY Nickel Compounds)/84.3 TPY * 100 = 2.50E-05 wt % less than 0.1wt% (Nickel Compounds is a carcinogen)

The uncontrolled weight percentage for Mercury Compounds (HgO):
Calculate the TPY uncontrolled emission rate of HgO (based on WSRC-TR-95-00247 stream information)
(9.97E-02 lb/hr)(86 hr/batch)(60 batches/yr)(1 ton/2000 lb) + (8.82E-13 lb/hr)(86 hr/batch)(60 batches/yr)(1 ton/2000 lb) + (2.29E-02 lb/hr)(115 hr/batch)(60 batches/yr)(1 ton/2000 lb) + (3.10E-08 lb/hr)(86 hr/batch)(60 batches/yr)(1 ton/2000 lb) = 3.36E-01 TPY HgO uncontrolled

(3.36E-01 TPY HgO)/(84.3 TPY) * 100 = 0.4 wt% Mercury Compounds
Mercury and Mercury Compounds are not Carcinogens and meet the definition of trace. Mercury would have a lower weight percentage than Mercury Compounds due to lower molecular weight
Therefore, the FAVC is a voluntary control device.

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Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Tables 4 through 6 represents the emissions impacts at SDP0001, SDP0009, and SDP0019 resulting from the modification.

Table 4 SDP0001 – No change – Maximum potential to emit calculation contained in SRNS-J2200-2019-00240 not impacted

	176S	177S	178S	SDP1 Total	SDP1	SDP1 Total
Constituent	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
Water	69.87		37.75	1.08E+02	1.23E-02	5.38E-02
Nitrogen	8.36			8.36E+00	9.54E-04	4.18E-03
Iron Oxide	0.25			2.50E-01	2.85E-05	1.25E-04
Sodium Nitrite	0.09	0.01		1.00E-01	1.14E-05	5.00E-05
Sodium Nitrate			0.03	3.00E-02	3.42E-06	1.50E-05
Sodium Oxalate		0.01	0.01	2.00E-02	2.28E-06	1.00E-05
Sodium Carbonate	0.07			7.00E-02	7.99E-06	3.50E-05
Uranium Oxide	0.03			3.00E-02	3.42E-06	1.50E-05
Manganese Dioxide	0.03			3.00E-02	3.42E-06	1.50E-05
Calcium Carbonate	0.02			2.00E-02	2.28E-06	1.00E-05
Water		69.45		6.95E+01	7.93E-03	3.47E-02
Sodium Formate		0.02		2.00E-02	2.28E-06	1.00E-05
Sodium Nitrate		0.01		1.00E-02	1.14E-06	5.00E-06
Magnesium Oxide	0.01			1.00E-02	1.14E-06	5.00E-06
Sodium Monoxide	0.01			1.00E-02	1.14E-06	5.00E-06
Formic Acid						
Nitric Aid						
Potassium Permanganate						
Copper Oxalate Hemihydrate						
Dimethyl Methyl Siloxane						
Poly Monoallyl Ether Acetate						
Oxalic Acid						

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 5 SDP0009 – No more Formic Acid or Oxalic Acid Emissions – All other Maximum potential to emit calculation contained in SRNS-J2200-2019-00240 not impacted

													SDP9 Total	SDP9 Total	SDP9 Total
	121S	111S	109S	108S	107S	106S	105S	103S	102S	101S	100S	98S			
Constituent	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
Water	1.4	1.59	13.33	31.93	17.16	2.2	1.78	13.5	379.02	9.14	6.35	16.09	4.93E+02	5.63E-02	2.47E-01
Nitrogen															
Iron Oxide															
Sodium Nitrite										0.25			2.50E-01	2.85E-05	1.25E-04
Sodium Nitrate															
Sodium Oxalate															
Sodium Carbonate															
Uranium Oxide															
Manganese Dioxide															
Calcium Carbonate															
Water															
Sodium Formate															
Sodium Nitrate															
Magnesium Oxide															
Sodium Monoxide															
Formic Acid	0			0	0								0.00E+00	0.00E+00	0.00E+00
Nitric Aid		0.56	4.74								16.41	41.59	6.33E+01	7.23E-03	3.17E-02
Potassium Permanganate			0.01										1.00E-02	1.14E-06	5.00E-06
Copper Oxalate Hemihydrate						0.01							1.00E-02	1.14E-06	5.00E-06
Dimethyl Methyl Siloxane							0.13						1.30E-01	1.48E-05	6.50E-05
Poly Monoallyl Ether Acetate							0.08						8.00E-02	9.13E-06	4.00E-05
Oxalic Acid								0	0				0.00E+00	0.00E+00	0.00E+00

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 6 SDP19 - No more Formic Acid or Oxalic Acid Emissions – Emission point will no longer emit any regulated pollutants

					SDP19 Total	SDP19 Total	SDP19 Total
	132S	131S	129S	128S			
Constituent	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
Water	8.4	28.18	28.18	40.18	104.94	1.20E-02	5.25E-02
Nitrogen							
Iron Oxide							
Sodium Nitrite							
Sodium Nitrate							
Sodium Oxalate							
Sodium Carbonate							
Uranium Oxide							
Manganese Dioxide							
Calcium Carbonate							
Water							
Sodium Formate							
Sodium Nitrate							
Magnesium Oxide							
Sodium Monoxide							
Formic Acid		0	0	0	0	0.00E+00	0.00E+00
Nitric Aid							
Potassium Permanganate							
Copper Oxalate Hemihydrate							
Dimethyl Methyl Siloxane							
Poly Monoallyl Ether Acetate							
Oxalic Acid	0				0.00E+00	0.00E+00	0.00E+00

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 7 through 9 present the regulated emissions from SDP0001, SDP0009, and SDP0019

Table 7 – No impacts at SDP1

SDP1 REGULATED COMPOUNDS

	176S	177S	178S	SDP1 Total	SDP1	SDP1 Total
	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
PM	5.10E-01	5.00E-02	4.00E-02	6.00E-01	6.85E-05	3.00E-04
PM10	5.10E-01	5.00E-02	4.00E-02	6.00E-01	6.85E-05	3.00E-04
PM2.5	5.10E-01	5.00E-02	4.00E-02	6.00E-01	6.85E-05	3.00E-04
Manganese Cmpds	3.00E-02	0.00E+00	0.00E+00	3.00E-02	3.42E-06	1.50E-05

Table 8

SDP9 REGULATED COMPOUNDS															
	121S	111S	109S	108S	107S	106S	105S	103S	102S	101S	100S	98S	SDP9 Total	SDP9 Total	SDP9 Total
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
PM			1.00E-02			1.00E-02		0.00E+00	0.00E+00	2.50E-01			2.70E-01	3.08E-05	1.35E-04
PM10			1.00E-02			1.00E-02		0.00E+00	0.00E+00	2.50E-01			2.70E-01	3.08E-05	1.35E-04
PM2.5			1.00E-02			1.00E-02		0.00E+00	0.00E+00	2.50E-01			2.70E-01	3.08E-05	1.35E-04
Manganese Cmpds	0	0	0.01	0	0	0	0	0	0	0	0	0	1.00E-02	1.14155E-06	0.000005
VOC	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-01	2.40E-05	1.05E-04
formic acid	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
nitric acid	0.00E+00	5.60E-01	4.74E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E+01	4.16E+01	6.33E+01	7.23E-03	3.17E-02
oxalic acid								0	0				0.00E+00	0.00E+00	0.00E+00

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 9

SDP19 REGULATED COMPOUNDS

	132S	131S	129S	128S	SDP19 Total	SDP19 Total	SDP19 Total
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	TPY
PM	0				0.00E+00	0.00E+00	0.00E+00
PM10	0				0.00E+00	0.00E+00	0.00E+00
PM2.5	0				0.00E+00	0.00E+00	0.00E+00
Manganese Cmpds							
VOC	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
formic acid		0	0	0	0.00E+00	0.00E+00	0.00E+00
nitric acid							
oxalic acid	0	0	0	0	0.00E+00	0.00E+00	0.00E+00

Table 10 represents all the non-SDP0007 regulated emissions for the DWPF process

Table 10

	lb/hr	TPY
PM	9.93E-05	4.35E-04
PM10	9.93E-05	4.35E-04
PM2.5	9.93E-05	4.35E-04
Manganese Cmpds	4.57E-06	2.00E-05
VOC	2.40E-05	1.05E-04
formic acid	0.00E+00	0.00E+00
nitric acid	7.23E-03	3.17E-02
oxalic acid	0.00E+00	0.00E+00

DHEC Form 2566 – Attachment H

Calculation Sheet

DWPF Process Maximum Potential to Emit Calculations Post Modification to Glycolic Acid

Table 11 is the total emissions from the DWPF process.

		Uncontrolled						Controlled					
		SDP7	SDP7	other EPs	other EPs	Total DWPF process		SDP7	SDP7	other EPs	other EPs	Total DWPF process	
CAS #		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
630-08-0	Carbon monoxide	2.50E+00	8.60E+00			2.50E+00	8.60E+00	2.50E+00	8.60E+00			2.50E+00	8.60E+00
124-38-9	Carbon dioxide (GHG)	8.31E+01	2.39E+02			8.31E+01	2.39E+02	8.31E+01	2.39E+02			8.31E+01	2.39E+02
7697-37-2	Nitric acid			7.23E-03	3.17E-02	7.23E-03	3.17E-02			7.23E-03	3.17E-02	7.23E-03	3.17E-02
1024-97-2	Nitrous oxide (GHG)	3.70E+00	1.10E+01			3.70E+00	1.10E+01	3.70E+00	1.10E+01			3.70E+00	1.10E+01
	Total Particulate	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	PM-10	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	PM-2.5	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01	1.18E-01	3.28E-01	9.93E-05	4.35E-04	1.18E-01	3.28E-01
	Nitrogen oxides (NO2) [MW=46.01]	2.49E+01	6.43E+01			2.49E+01	6.43E+01	2.49E+01	6.43E+01			2.49E+01	6.43E+01
	VOC			2.40E-05	1.05E-04	2.40E-05	1.05E-04			2.40E-05	1.05E-04	2.40E-05	1.05E-04
	Lead compounds (PbO)	1.69E-06	5.82E-06			1.69E-06	5.82E-06	1.69E-06	5.82E-06			1.69E-06	5.82E-06
	Manganese compounds (MnO2)			4.57E-06	2.00E-05	4.57E-06	2.00E-05			4.57E-06	2.00E-05	4.57E-06	2.00E-05

DHEC Form 2566 – NSR Review and Aggregation – Attachment I

Standard No. 7 Prevention of Significant Deterioration (PSD)

For the proposed change from formic acid to glycolic acid at the SRS vitrification process (EU16), the monthly production of canisters has been reviewed with the tables shown below supporting the Standard No. 7 applicability determination. Based on the data presented below, Standard No. 7 will not apply utilizing the starting months of September, October, or November 2011 as baseline actual emissions. The maximum potential to emit once the change to glycolic acid is complete will be 64.3 TPY NOx as NO_2. The calculated data below utilizes the methodology contained in the Title V renewal application for the DWPF vitrification process (SRNS-J2200-2019-00240) to determine the baseline actual emissions.

Canister Production Rate (9/2011-10/2013)

Year	Month	Canisters Produced	Year	Month	Canisters Produced
2011	September	31	**2013**	January	7
	October	17		February	16
	November	20		March	20
	December	37		April	26
2012	January	27		May	15
	February	28		June	23
	March	30		July	21
	April	21		August	40
	May	34		September	24
	June	30		October	2
	July	20			
	August	4			
	September	9			
	October	11			
	November	6			
	December	15			

DHEC Form 2566 – NSR Review and Aggregation – Attachment I

Canister Production Interval	Canisters produced in 24 consecutive months	Batches (Calculated)	Batches (Rounded)
Starting with September 2011	508	72.57142857	72
Starting with October 2011	501	71.57142857	71
Starting with November 2011	486	69.42857143	69

SDP7 Process Sources Batch Operating Parameters

Process Vessel	Operating Rate
SRAT	86 hr/batch
SME	86 hr/batch
Melter	115 hr/batch

Canister Batch Production Rate	7 canisters/batch

From SRNS-J2200-2019-00240

	SRAT limited	SRAT limited	Melter limited	Melter limited	SRAT limited
Choi Stream	39	166	185	94	4
	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
NOx as NO_2	2.89E+00	1.98E-11	0.00E+00	1.03E+01	5.19E-12

64.3 TPY NOx as NO_2 (Q-ESR-S-00002)

Net NOx Emissions Increase (TPY)

ton/24 consecutive months starting 9/2011	ton/24 consecutive months starting 10/2011	ton/24 consecutive months starting 11/2011	Average TPY starting 9/2011	Average TPY starting 10/2011	Average TPY starting 11/2011	Net emissions increase starting 9/2011 (TPY)	Net emissions increase starting 10/2011 (TPY)	Net emissions increase starting 11/2011 (TPY)
5.15E+01	5.08E+01	4.94E+01	2.58E+01	2.54E+01	2.47E+01	3.85E+01	3.89E+01	3.96E+01

DHEC Form 2566 – NSR Review and Aggregation – Attachment I

Aggregation Analysis

There have been no projects performed in S-Area (DWPF) in recent years (i.e., the last three years) that should be aggregated with the proposed chemical flowsheet change for the DWPF vitrification process.

The DWPF vitrification process has been operational for twenty-five years (Startup: April 1996). Initially, sludge feed material was introduced into the DWPF process after being processed by the ARP/MCU process to remove actinides and lower or remove the cesium content from the sludge. The Salt Waste Processing Facility (SWPF) was started up in October 2020 to provide a more efficient method of actinide and cesium removal. SWPF, as well as, the past ARP/MCU process should be considered separate processes and emission points and not a single or substantially related project with the DWPF vitrification process as described in the 2009 New Source Review Aggregation Action and clarified by the Environmental Protection Agency in a Final Action dated November 15, 2018 (83 Fed. Reg. 57324).

Changes to the DWPF vitrification process with the implementation of the nitric-glycolic flowsheet will have no impact on any other permitted Liquid Waste air emission point or source. The flowsheet implementation will impact the DWPF vitrification process by replacing formic acid as the reductant to glycolic acid, increasing the volume of nitric acid used for each processing cycle, adding sodium permanganate for converting glycolates to oxalates. The change to glycolic acid as the reductant will allow the more efficient conversion of mercury compounds in the raw sludge to its metal state thus allowing the metal to be steam stripped out of the feed stream. The current nitric-formic acid flowsheet uses formic acid as the reductant; the proposed nitric-glycolic acid flowsheet uses glycolic acid. Glycolic acid is more effective at reducing mercury while minimizing hydrogen gas generation as compared to formic acid. This also requires the use of less reductant. Change in the volume of nitric acid together with the reductant, ensures that the proper oxidation-reduction reactions occur in the 221-S Chemical Process Cell (CPC). The correct oxidation-reduction potential ensures a balance of feed flowability, melt characteristics, and Melter operating life. Inherently, because the mercury stripping requires less reductant, extra nitric acid ensures the feed has the correct acidity. Increased NOx emissions are the expected result. Using glycolic acid introduces residual glycolates that could be in the waste streams recycled to the Tank Farms. Under certain conditions, the glycolates can break down into flammable gases. To minimize glycolate recycle, the Recycle Collection Tank will receive sodium permanganate as a precaution to oxidize the glycolates into oxalates (which have a low flammable gas generation potential). This operation should not increase manganese emissions (from any of the processing vessels), but higher manganese compound concentrations in future sludge batches will increase the acid demand. The nitric acid volume used for this analysis incorporates the added manganese in the sludge.

The change to the nitric-glycolic acid flowsheet for the DWPF vitrification process was not made as a result of SWPF coming on-line. It was made to realize the benefits noted it the paragraph above. The proposed nitric-glycolic acid flowsheet change project and the SWPF construction and operation project are not artificially or unreasonably separated activities, as the flowsheet change is not interrelated or dependent upon SWPF coming on-line, the projects were not jointly planned, involve distinct capital funding cycles, rely upon separate engineering studies and are operated by different contractors.

Further, even if the SWPF were considered to be substantially related for aggregation purposes, the contribution of the SWPF to the Site or S-Area NOx emissions would be negligible. Specifically, the maximum emission rate of NOx as NO_2 from SWPF documented in a January 20, 2014 memorandum from K.A. Wolfe to G. C. Fanning entitled *Supporting Documentation for Emission Rates from Salt Waste Processing Facility (SWPF)*, SRNS-J2210-2014-0001, was shown to be 0.05 TPY. The SWPF source of the NOx as NO_2 emissions were from the JDP2 Cold Chemicals Tanks. Relative to the calculated maximum NOx as NO_2 emission rate for the change from formic acid to glycolic acid at the SRS vitrification process (EU16), the emissions from SWPF are negligible and would not push the NOx as NO_2 emission rate over the 40 TPY net emissions increase. SWPF air emissions of other toxic, hazardous, or criteria air pollutants (Mercury, Nitric Acid, Methanol, and VOCs) would also be negligible compared to those from the proposed nitric-glycolic acid flowsheet.

There are no other processes or projects that are artificially or unreasonably separated from the proposed nitric-glycolic acid flowsheet for the DWPF vitrification process and thereby would be treated as a single project for aggregation purposes.

DHEC Form 2566 – Regulatory Review - Attachment J

The regulatory review narrative required in Section 4 of DHEC Form 2566, Construction Permit Application, is summarized in the table below:

Regulation	Applicable	Applicability Determination	Specific Limitations and/or Requirements that apply	Compliance Demonstrated
S.C. Regulation 61-62.1 Section II.E Synthetic Minor Construction Permits	No	The facility is not requesting a federally enforceable construction permit condition to constrain the operation of this source to become a minor source.	N/A	N/A .
S.C. Regulation 61-62.5 Air Pollution Control Standards: Standard No. 1 Emissions from Fuel Combustion	No	The emission sources described in this application are not fuel burning operations.	N/A	N/A
Standard No. 2 Ambient Air Quality	Yes	The emission sources described in this application will emit Standard 2 pollutants (PM10, PM2.5, CO, VOC [ozone precursor], NOx as NO_2, and lead)	The proposed modification will not trigger Prevention of Significant Deterioration (PSD) permitting actions. PM2.5 and PM10 are below the de minimis emission point level for 1.14 lb/hr for every emission point associated with this modification and the vitrification process so the PM2.5 and PM10 modeling files will not be impacted. CO emissions will now occur at emission point SDP007 but at levels below 5 TPY which makes it exempt from modeling requirements. Facility wide emission levels of lead are below 0.5 TPY so it is not necessary for Lead to be modeled. VOC emissions at all emission points associated with this modification remain below 1000 lb/month. NOx as NO2 emissions have been remodeled to incorporate the new maximum potential to emit hourly remission rate at emission point SDP0007 (only location of NOx emissions for this process and modification).	Potential Emission Rates at Maximum Design Capacity table for emission rate of Standard No. 2 pollutants from the vitrification process. Modeling files have been provided to demonstrate SRS will remain compliant with Standard No. 2 at the increased emission rate of NOx as NO_2.
Standard No. 3 Waste Combustion and Reduction (state only)	No	The emission sources described in this application wil not involve waste burning.	N/A	N/A

DHEC Form 2566 – Regulatory Review - Attachment J

Regulation	Applicable	Applicability Determination	Specific Limitations and/or Requirements that apply	Compliance Demonstrated
Standard No. 4 Emissions from Process Industries	Yes	The emission sources described in this application have the potential to emit particulate matter (PM)	The process weight into the process is relative to the glass produced by the vitrification process. With the proposed change to glycolic acid the maximum glass production rate will remain ~1,500,000 lb/year. Therefore, the process weight reported in the Title V renewal application of 0.24 tons/hr) is still appropriate. This results in (1) x (4.10) x (0.24 ton/hr)$^{0.67}$ = 1.6 lb/hr as the allowable emission rate in lb/hr based on the calculation contained in Standard No. 4.	Refer to Potential Emission Rates at Maximum Design capacity table. The EU 16 lb/hr emission rate of PM is well below 1.16 lb/hr. The current Title V permit conditions sufficiently address opacity limits at EU 16.
Standard No. 5 Volatile Organic Compounds	No	The SRS does not operate a process described in R.61-62.5 Standard No. 5 Section II. (R.61-62.5 Standard No. 5 Section I Part B).	N/A	N/A
Standard No. 5.2 Nitrogen Oxides Lowest Achievable Emission Rate	No	The emission sources described in this application do not emit NOx generated from fuel combustion.	N/A	N/A
Standard No. 7 Prevention of Significant Deterioration (PSD)	No	Refer to Attachment I. Based on the attached Standard No. 7 applicability calculation and discussion on aggregation, the proposed modification will not result in an increase of 40 TPY or more of NOx. This is based on the actual-to-projected-actual applicability test that was performed in accordance with R.61-62.1 Standard No. 7(A)(2)(d)(iii).	N/A	N/A
Standard No. 7.1 Nonattainment New Source Review (NSR)	No	The emission sources described in this application are located in Aiken County, not a nonattainment area.	N/A	N/A

DHEC Form 2566 – Regulatory Review - Attachment J

Regulation	Applicable	Applicability Determination	Specific Limitations and/or Requirements that apply	Compliance Demonstrated
Standard No. 8 Toxic Air Pollutants (TAPs) (state only)	Yes	The emission sources described in this application emit non-trace quantities of the toxic air pollutant (TAP) nitric acid (7697-37-2). It should be noted that oxalic acid and formic acid will no longer be emitted by the vitrification process or supporting equipment once the proposed modification is implemented. The manganese compound emissions at SDP9 will not be impacted. However, the manganese compound emissions at SDP7 are no longer included in modeling since they meet the definition of trace.	Nitric acid is the only TAP emitted at non trace quantities per modeling files and DHEC Form 2573 information. The electronic modeling file for nitric acid will be provided to SCDHEC as part of this application transmittal. It should also be noted that with implementation of the changes addressed in this application, the non-trace emissions of the HAP formic acid will be eliminated. Table 1 - Standard 8 toxic pollutants modeled in AERMOD is attached and demonstrates that the site will be compliant with Standard 8 with the implementation of the changes contained in this construction permit application.	DHEC Form 2573 attached and electronic modeling files for nitric acid.
S.C. Regulation 61-62.6 Control of Fugitive Particulate Matter	No	The emission sources described in this application will not result in the generation of fugitive particulate matter.	N/A	N/A
S.C. Regulation 61-62.60 and 40 CFR Part 60 New Source Performance Standards (NSPS)	No	40 CFR 60 Subpart CC: Applies to sources for which a standard is prescribed under 40 CFR 60 Subpart CC. The S001 process has a production rate of 1,573,200 lbs glass/year (well below 5 tons glass/day) None of the standards under 40 CFR 60 Subpart CC are applicable to the emission sources described in this application.	N/A	N/A

DHEC Form 2566 – Regulatory Review - Attachment J

Regulation	Applicable	Applicability Determination	Specific Limitations and/or Requirements that apply	Compliance Demonstrated
S.C. Regulation 61-62.63 and 40 CFR Part 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories	No	40 CFR 63: Applies to sources for which a standard is prescribed under 40 CFR 63. None of the standards under 40 CFR 63 are applicable to the emission sources described in this application.	N/A	N/A
40 CFR Part 64 Compliance Assurance Monitoring (CAM)	No	There are no control devices associated with the vitrification process or EU 16. Once the proposed modification is implemented the FAVC will be a voluntary control device since formic acid will no longer be emitted at emission point SDP007 and uncontrolled mercury and mercury compound emissions are below trace levels.	N/A	N/A
S.C. Regulation 61-62.68 and 40 CFR Part 68 Chemical Accident Prevention Provisions	No	The SRS does not exceed the thresholds contained in R61-62.68.	N/A	N/A
S.C. Regulation 61-62.70 and 40 CFR Part 70 Title V Operating Program	Yes	DWPF 221-S Vitrification Process is a major source listed on the SRS Title V air permit (EU16). EU16 will continue to comply with existing Title V permit conditions.	This activity will operate under the Construction permit issued by SCDHEC and the current Title V permit (0080-0041) conditions until the minor modification to the Title V permit is submitted and approved by SCDHEC. .	A modification to the Site's Title V permit will be submitted to incorporate the information provided in this construction permit application.
40 CFR 98 Green House Gas (GHG) emissions	No	Neither Standard No. 7 nor 7.1 are triggered therefore GHG emissions do not have to be quantified.	N/A	N/A

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A. APPLICATION IDENTIFICATION	
1. Facility Name: U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC; Liquid Waste Operations currently operated by Savannah River Remediation, LLC	
2. SC Air Permit Number (if known; 8-digits only): 0080 - 0041	3. Application Date: 10/14/2021
4. Project Description: Glycolic acid will replace formic acid in the vitrification process chemical flowsheet	

B. FACILITY INFORMATION	
1. Is your company a Small Business? ☐ Yes ☒ No	2. If a Small Business or small government facility, is Bureau assistance being requested? ☐ Yes ☐ No
3. Are other facilities collocated for air compliance? ☒ Yes ☐ No	4. If Yes, provide permit numbers of collocated facilities: Ameresco - 0080-0144

C. AIR CONTACT			
Consulting Firm Name (if applicable): N/A			
Title/Position: Air Program Lead, Environmental Compliance - SRNS, LLC	Salutation: Ms.	First Name: Kim	Last Name: Wolfe
Mailing Address: Savannah River Site 730-4B, Room 3051			
City: Aiken		State: SC	Zip Code: 29808-0001
E-mail Address: kim.wolfe@srs.gov		Phone No.: (803) 952-6853	Cell No.: (803) 507-2066

D. EMISSION POINT DISPERSION PARAMETERS

- Source data requirements are based on the appropriate source classification.
- Each emission point is classified as a point, area, volume, flare, area circular, area poly, or open pit source.
- Contact the Bureau of Air Quality for clarification of data requirements.
- Include sources on a scaled site map. Also, a picture of area or volume sources would be helpful but is not required.
- A user generated document or spreadsheet may be substituted in lieu of this form provided all of the required emission point parameters are submitted in the same order, units, etc. as presented in these tables.

Abbreviations / Units of Measure:

- AGL = Above Ground Level
- cal/s = calories per second
- ° = Degrees
- °F = Degrees Fahrenheit
- ft = feet
- ft/s = feet per second
- K = Kelvin
- m = meters
- UTM = Universal Transverse Mercator

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Reminder: For all Emission Points, list the unique Emission Point ID for that source. Use the same emission point ID as shown in the current permit and provided in the last submittal (as applicable). If the emission point ID has been changed from what was previously submitted, please list the current emission point ID with the old/previous emission point ID in parenthesis

E. POINT SOURCE DATA

Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance To Nearest Property Boundary (ft)	Building		
		Easting (m)	Northing (m)								Height (ft)	Length (ft)	Width (ft)
SDP007	221-S Vitrification Process (256S, 264S, 266S, 267S, 270S, 275S, 278S, 388S, 488S)	440288	3684005	147.0	80	85.0	5.0	Vertical	N	See modeling files	See modeling files	See modeling files	See modeling files
SDP009	Vitrification Process Tanks (098S, 100S, 101S, 102S, 105S, 106S, 107S, 108S, 109S, 111S, 121S) (103S will be AIP)	440450	3684123	144.0	80	45.0	8.0	Vertical	N	See modeling files	See modeling files	See modeling files	See modeling files
SDP0019	Vitrification Process Tanks (129S, 131S, 132S will be AIP and 128S will only emit water). This emission point will no longer emit regulated pollutants	440501	3684146	27.5	Amb.	0.0033	0.33	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files
SDP0067	Raw Material Tanks (286S, 289S, 291S, 293S) (288S AIP)	440494	3684139	27.5	Amb.	0.0033	0.33	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files
SDT0035	Organic Waste/Neutralization Tank #1 (3150 gal.)	440537	3684075	24.5	Amb.	0.0033	0.21	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files
SDT0036	Organic Waste Neutralization Tank #2 (3200 gal.)	440534	3684073	24.5	Amb.	0.0033	0.21	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files
SDT0043	Formic Acid Storage Tank #2 (6500 gal.) Will become Glycolic Acid Storage Tank (Will not emit any regulated pollutants due to very low vapor pressure.)	440498	3684137	27.5	Amb.	0.0033	0.17	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files
SDT0046	Formic Acid Storage Tank #1 (6500 gal.) (Will be AIP)	440504	3684141	27.5	Amb.	0.0033	0.17	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files

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Bureau of Air Quality
Emission Point Information

E. POINT SOURCE DATA

Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance To Nearest Property Boundary (ft)	Building		
		Easting (m)	Northing (m)								Height (ft)	Length (ft)	Width (ft)
SDT0047	Oxalic Acid Storage Tank (6000 gal.) (Will be AIP)	440579	3683316	27.5	Amb.	0.0033	0.75	Horizontal	N	See modeling files	See modeling files	See modeling files	See modeling files

F. AREA SOURCE DATA

Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Angle From North (°)	Distance To Nearest Property Boundary (ft)
		Easting (m)	Northing (m)					

G. VOLUME SOURCE DATA

Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Initial Horizontal Dimension σ_y (ft)	Initial Vertical Dimension σ_z (ft)	Distance To Nearest Property Boundary (ft)
		Easting (m)	Northing (m)				

H. FLARE SOURCE DATA												
Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Heat Release Rate (cal/s)	Exit Velocity (m/s)	Exit Temp. (K)	Heat Loss Fraction	Distance To Nearest Property Boundary (ft)	Building		
		Easting (m)	Northing (m)							Height (ft)	Length (ft)	Width (ft)

I. AREA CIRCULAR SOURCE DATA						
Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Radius of Area (ft)	Distance To Nearest Property Boundary (ft)
		Easting (m)	Northing (m)			

J. AREA POLY SOURCE DATA (Table 1)										
Emission Point ID	Description/Name/Area (ft^2)	Release Height AGL (ft)	UTM Coordinates (NAD83)							
			Easting-1 (m)	Northing-1 (m)	Easting-2 (m)	Northing-2 (m)	Easting-3 (m)	Northing-3 (m)	Easting-4 (m)	Northing-4 (m)

J. AREA POLY SOURCE DATA (Table 2)										
Emission Point ID	UTM Coordinates (NAD83)									
	Easting (m)	Northing (m)	Easting (m)	Northing (m)	Easting (m)	Northing (m)	Easting (m)	Northing (m)	Easting (m)	Northing (m)

K. OPEN PIT SOURCE DATA								
Emission Point ID	Description/Name	UTM Coordinates (NAD83)		Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Volume (ft^3)	Angle From North (°)
		Easting (m)	Northing (m)					

L. EMISSION RATES						
Emission Point ID	**Pollutant Name**	**CAS #**	**Emission Rate (lb/hr)**	**Same as Permitted? (1)**	**Controlled or Uncontrolled**	**Averaging Period**
SDP007	NOx as NO_2 (increase since last modeling)		24.9	☒ Yes ☐ No	Uncontrolled	1 hour
SDP007	Nitric Acid (now meets definition of Trace (0.06 wt%) remove from modeling file.	7697-37-2		☒ Yes ☐ No	Uncontrolled	24 hour
SDP007	Carbon Monoxide (increase since last modeling, below exemption rate)	630-08-0	2.50	☒ Yes ☐ No	Uncontrolled	1 hour
SDP007	PM10 (no change since last modeling)		1.18E-01	☒ Yes ☐ No	Uncontrolled	24 hour
SDP007	PM2.5 (no change since last modeling)		1.18E-01	☒ Yes ☐ No	Uncontrolled	24 hour
SDP007	Manganese Compounds (determined to be Trace since last modeling) - remove from file			☒ Yes ☐ No	Uncontrolled	24 hour
SDP007	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP007	Oxalic Acid (eliminated since last modeling)	144-62-7	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	Manganese Compounds (no change)	7697-37-2	1.14E-06	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	Oxalic Acid (eliminated since last modeling)	144-62-7	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	Nitric Acid (no change)	7697-37-2	7.23E-03	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	PM10 (decrease since last modeling and still below exemption rate)		3.08E-05	☒ Yes ☐ No	Uncontrolled	24 hour
SDP009	PM2.5 (decrease since last modeling and still below exemption rate)		3.08E-05	☒ Yes ☐ No	Uncontrolled	24 hour
SDP0019	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP0019	Oxalic Acid (eliminated since last modeling)	144-62-7	0	☒ Yes ☐ No	Uncontrolled	24 hour

L. EMISSION RATES						
Emission Point ID	Pollutant Name	CAS #	Emission Rate (lb/hr)	Same as Permitted? [1]	Controlled or Uncontrolled	Averaging Period
SDP0019	PM10 (eliminated since last modeling, last modeling below exemption rate)		0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP0019	PM2.5 (eliminated since last modeling, last modeling below exemption rate)		0	☒ Yes ☐ No	Uncontrolled	24 hour
SDP0067	Nitric Acid (slight increase since last modeling)	7697-37-2	3.80E-03	☒ Yes ☐ No	Uncontrolled	24 hour
SDT0035	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDT0036	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDT0043	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDT0046	Formic Acid (eliminated since last modeling)	64-18-6	0	☒ Yes ☐ No	Uncontrolled	24 hour
SDT0047	Oxalic Acid (eliminated since last modeling)	144-62-7	0	☒ Yes ☐ No	Uncontrolled	24 hour

(1) Any difference between the rates used for permitting and the air compliance demonstration must be explained in the application report.