SWCAA
Southwest Clean Air Agency

TECHNICAL SUPPORT DOCUMENT

Air Discharge Permit ADP 20-3409
ADP Application L-706

Cardinal FG Company Winlock
SWCAA ID - 2175

Final Issued: February 11, 2021

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Abbreviations

ADP	Air Discharge Permit
AP-42	Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency
BACT	Best available control technology
BART	Best Available Retrofit Technology
Btu	British thermal unit
cfm	Cubic feet per minute
CPM	Condensable particulate matter
CFR	Code of Federal Regulations
CO	Carbon monoxide
EPA	U.S. Environmental Protection Agency
gr/dscf	Grains per dry standard cubic foot (68 °F, 1 atmosphere)
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
LAER	Lowest achievable emission rate
lb/hp-hr	Pounds per horsepower hour
lb/hr	Pounds per hour
lb/MMBtu	Pounds per million British thermal units
lb/ton	Pounds per ton
lb/yr	Pounds per year
MMBtu/hr	Millions of British thermal units per hour
MSDS	Material Safety Data Sheet
NO_x	Nitrogen oxides
NOV	Notice of Violation
oz/yd^2	Once per square yard
PM	Total particulate matter (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable and condensable particulate matter as measured by EPA Methods 5 and 202)
ppmv	Parts per million by volume
ppmvd	Parts per million by volume, dry
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
RCW	Revised Code of Washington
SQER	Small Quantity Emission Rate listed in WAC 173-460
SO_2	Sulfur dioxide
SWCAA	Southwest Clean Air Agency
TAP	Toxic air pollutant pursuant to Chapter 173-460 WAC
T-BACT	Best Available Control Technology for toxic air pollutants
tpd	Tons per day
tph	Tons per hour
tpy	Tons per year
TWA	Time weighted average
VOC	Volatile organic compound
WAC	Washington Administrative Code

1. FACILITY IDENTIFICATION

Applicant Name:	Cardinal FG Company Winlock
Applicant Address:	545 Avery Road West, Winlock, WA 98596
Facility Name:	Cardinal FG Company Winlock
Facility Address:	545 Avery Road West, Winlock, WA 98596
SWCAA Identification:	2175
Facility Contact:	Stephen Mullinax, Environmental Engineer
Primary Process:	Flat Glass / Flat Glass Manufacturing
SIC/NAICS Code:	3211 / 327211
Facility Classification:	Major stationary source

2. FACILITY DESCRIPTION

Cardinal FG Company Winlock (Cardinal) operates a flat glass manufacturing plant located near the intersection of Avery Road and Highway 603 in Winlock, Washington. The facility is similar in design to plants operated by other Cardinal companies in Wisconsin (Menomonie and Portage), Oklahoma (Durant) and North Carolina (Mooresville).

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number L-706 (ADP Application L-706) dated November 5, 2019. Cardinal FG Company Winlock submitted ADP Application L-706 requesting approval of the following:

- Installation of a selective catalytic reduction (SCR) system to control NO_X emissions from the Glass Furnace;
- Increase in rated furnace production from 650 tpd to 750 tpd;
- Removal of SCR from Emergency Generator #1;
- Installation of a new emergency generator; and
- Establishment of voluntary emission limits at levels below major source thresholds.

The current permitting action provides approval for the modifications proposed in ADP Application L-706. ADP 04-2568R2 will be superseded in its entirety by this permitting action. After demonstration of compliance with the requirements of ADP 04-2568R2, the Washington Department of Ecology will rescind Prevention of Significant Deterioration permit PSD 03-03-A2.

4. PROCESS DESCRIPTION

4.a Raw Material Handling (*existing*). The manufacturing process primarily uses the following raw materials: silica sand, soda ash, nepheline syenite feldspar, high calcium limestone (calcium carbonate), dolomitic limestone (calcium-magnesium carbonate), salt cake (sodium sulfate), cullet (broken glass), rouge (iron), and carbon. Other minor additives are incorporated as necessary to give desired special product qualities (e.g., color or photo-filtration). Raw materials are received in bulk by rail and truck from commercial suppliers and stored in bins or silos. Truck and railcar shipments are received with a single below-grade unloading hopper. The railcar/truck unloading operation is enclosed in a steel building with a concrete floor. A conveyor beneath the unloading hopper feeds a bucket elevator discharging into a rotary distributor above the top of the storage silos. Dust from receiving operations is controlled with process enclosure and multiple dust collectors. Typical operation is less than 40 hr/wk.

The facility batch plant prepares the proper mix of materials for use in the Glass Furnace. Raw materials are withdrawn from storage silos/bins and conveyed into hopper scales for weighing. Cullet (scrap glass) from both

onsite and offsite is stored and metered in the batch plant. Each batch of weighed materials is mechanically mixed and conveyed to a charging bin near the melting furnace. Maximum material throughput is specified as 750 tpd. Typical operation is 18 hr/dy.

4.b Glass Furnace (*modified*). Mixed raw materials and cullet are fed into the melting section of a natural gas-fired melting furnace, where they are refined and temperature conditioned. Molten glass flows from the melting section onto the surface of a tin bath, creating a ribbon of floating glass extending to the bath exit. The float or "tin" bath consists of a refractory lined chamber containing molten tin 2 to 4 inches deep with a steel roof housing electric heating elements. Tools are inserted through seals in the sides of the bath to control ribbon width, thickness, and temperature. Rolls at the bath exit pull the floating glass ribbon through the bath. A hydrogen and nitrogen atmosphere is maintained inside the bath section to prevent tin oxidation. Maximum glass production is rated at 650 tpd.

During normal operation, production disruptions of up to 72 hours in length may occasionally occur, largely due to interruption of the glass ribbon at the tin bath. During these periods, no raw materials are fed into the furnace. Periodically, furnace maintenance requires a "burn-out" procedure to remove sulfate deposits from the refractory checkers. The facility may conduct up to two burn-outs per year with each period lasting no longer than 14 days. The Glass Furnace operates in multi-year production cycles. At the end of each cycle, glass is drained from the furnace and it is rebricked (90-120 day period). Equipment associated with the glass making process (including air pollution control equipment) is inspected and overhauled at that time.

ADP Application L-706. Cardinal proposes to install an SCR system in the furnace exhaust and increase maximum rated production from 650 tpd to 750 tpd. Use of the 3R Process will cease once the SCR system commences operation. A new supplemental heater will be installed between the ESP and the SCR system to raise exhaust stream temperatures to the range required for proper SCR operation. Once the SCR system is in use, burn-out emissions will be fully controlled and restrictions on burn-out will be removed.

4.c Annealing Lehr (*existing*). Glass ribbon exits the tin bath and enters the lehr, which is a roller hearth oven designed to slowly cool the glass ribbon after it exits the float bath. Cooling rates are controlled both across the width of the lehr and along its length to prevent the formation of excessive stresses in the glass (annealing). In the first part of the lehr, heat is supplied by electric heating elements to compensate for heat losses from the ribbon edges. A system of fans and ducts provides atmospheric air as the cooling medium. Heat is transferred from the glass to the air by a combination of tube heat exchangers and by direct impingement of air on the glass. The glass ribbon is transported through the lehr by mechanically driven rolls. Sulfur dioxide (SO_2) from storage tanks is injected on the rollers and the top and bottom surfaces of the glass to prevent staining. Unreacted SO_2 gas exhausts to the Glass Furnace headspace. As the glass ribbon exits the lehr, it passes through an inspection booth where defects are identified and marked. Defective sections are later scrapped and returned as cullet for remelting.

4.d Glass Cutting (*existing*). As the glass ribbon travels toward the packing area on rollers, cutting wheels automatically score the ribbon to define the final lite size and remove non-saleable ribbon edges. A lubricant (mineral spirits) is applied to the cutting wheels to assist in cutting the glass. The lubricant evaporates into the building and is released as a fugitive emission. Emissions are minimized by controlling usage of the cutting lubricant. As the ribbon proceeds down the production line, right angle scores, edge trim scores and parallel scores are sequentially "snapped" to form individual glass lites. Edge trim and rejected lites (cullet) are reduced in size by glass breakers underneath the cutting station. These breakers discharge onto a belt conveyor located in a sub-floor tunnel. A second belt conveyor at right angles to the cutting conveyors moves cullet from the tunnel belt to the exterior of the lehr building. A third belt, above grade, transfers cullet to the batch plant and/or flat storage area.

4.e Glass Packaging and Storage (*existing*). Finished glass lites are packed on metal racks or in wooden cases using mechanical and/or manual means depending upon piece size. Racks and cases of glass are transported through the

warehouse by battery-powered industrial trucks. The glass packing lines include powder applicators, hopper/crushers, and various handling conveyors. Air pollution (dust) emissions from packing operations are generally minor. The facility's original packing lines are served by Cullet Return System #1. The new packing lines being proposed in ADP Application L-627 will be served by a new dust collection system designated as Cullet Return System #2.

4.f Emergency Power Generation (*modified*). One diesel engine driven generator is used to generate emergency electrical power for the facility. Operation of the generator for the purposes of maintenance and testing is limited to a maximum of 200 hr/yr. Emissions from the diesel engine are minimized by use of a selective catalytic reduction (SCR) system and low sulfur fuel (≤ 0.05% sulfur content).

ADP Application L-706. Cardinal proposes to install a second diesel engine driven generator at the Winlock facility and remove the SCR system from the existing generator. Testing and maintenance of both generators will be conducted according to the same procedures currently in use. Operation for maintenance and testing will be reduced to a maximum of 50 hr/yr per engine.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a Glass Furnace (*modified*). One site-built float furnace with a side port, multi-cell regenerative configuration. SO_2 emissions are controlled by raw material selection and a spray dryer. PM emissions are controlled with an electrostatic precipitator (ESP). NO_X and CO emissions from the furnace are controlled with the use of *3R Process* combustion management. The *3R Process* does not operate during the "burn-out" periods. First glass pull from the furnace occurred on September 26, 2006. The furnace was partially rebricked in February/March 2019.

Rated Heat Input:	200.0 MMBtu/hr
Capacity:	650 tpd
Fuel:	Natural gas
ESP Make/Model:	United McGill
Exhaust:	8' dia vertical stack at ~175' above ground level.

ADP Application L-706. Cardinal proposes to make two modifications to the existing furnace. The first modification is to increase maximum rated furnace capacity from 650 tpd to 750 tpd of glass. Increased production capacity will require a corresponding increase in rated heat input and material throughput. Existing burners and material handling equipment can support the proposed production rate, so this modification is expected to require only minor physical changes. The second modification is installation of a dedicated SCR system for control of NO_X emissions. The proposed SCR system is guaranteed by the manufacturer to reduce NO_X emissions by a minimum of 80%. The SCR system is intended to replace the 3R Process, which will be removed from service once the SCR system commences operation. The proposed modifications will increase potential emissions of VOC, SO_2, PM and HAP/TAP. Potential emissions of NO_X and CO will decrease. Installation of the SCR system is a voluntary action by Cardinal and not considered to be a BACT measure.

The temperature of the furnace exhaust stream at the exit of the ESP is typically 360-400 °F. The proposed SCR system requires incoming gas flow to have a minimum temperature of ~600 °F to ensure proper operation. Cardinal proposes to increase operating temperatures in the ESP/Spray Dryer and install a new, direct fired heater in the exhaust ductwork between the ESP and the SCR system to heat the exhaust stream to the minimum temperature required by SCR system.

The facility's current permit allows by-pass of the ESP/Spray Dryer for purposes of maintenance for up to 5 days per year. This provision will be maintained going forward. A similar allowance will be added for maintenance and

inspection of the SCR system. Maintenance of each system may, may not be conducted at the same time. The proposed exhaust ductwork configuration will allow for by-pass of either system individually.

After modification, the Glass Furnace will have the following specifications:

Glass Furnace	
Rated Heat Input:	*231.0 MMBtu/hr*
Capacity:	*750 tpd*
Fuel:	*Natural gas*
ESP Make/Model:	*United McGill*
Exhaust:	*8' dia vertical stack at ~175' above ground level*
Exhaust Reheater	
Rated Heat Input:	*17.0 MMBtu/hr (nominal)*
Fuel:	*Natural gas*
Exhaust:	*Exhausted through furnace exhaust stack.*

5.b Annealing Lehr (*existing*). One site built annealing lehr with direct SO_2 injection. Exhaust streams from the lehr are vented back into the Glass Furnace and exhausted through the Glass Furnace exhaust stack.

5.c Glass Cutting Operations (*existing*). Multiple cutting wheel assemblies used to size and trim product by scoring glass ribbon subsequent to production. This operation applies mineral spirits to the glass ribbon as a cutting lubricant.

5.d Baghouse / Cullet Return System #1 (*existing*). Cullet return system #1 conveys broken/reject lites and glass dust from the production line back to the cullet flat storage area at a maximum rate of 650 tpd. The cullet return baghouse is used in conjunction with equipment enclosure to control dust emissions from the portion of the glass return system operating at the production line.

Mfg / Model:	Donaldson / 324MBWS10
Rated Airflow:	41,500 acfm
Filtration Area / Media:	5,196 ft^2 of 10.5 oz/yd^2 Dura-Life Polyester
Cleaning System:	Reverse Pulse-jet
Exhaust Configuration:	34" dia exhaust discharging vertical at 100' above grade

5.e Baghouse / Cullet Return System #2 (*existing*). Cullet return system #2 collects and conveys broken/reject glass and glass dust from the lite packing lines approved under ADP Application L-627.

Mfg / Model:	Carothers and Son / 195TR10HEI
Rated Airflow:	25,000 acfm
Filtration Area / Media:	3,120 ft^2 of 16 oz/yd^2 polyester
Cleaning System:	Reverse Airjet
Exhaust Configuration:	32" dia exhaust discharging vertical at 32' 6" above grade

5.f EP Dust Collection System / Baghouse #1 (*existing*). A pneumatic transfer system is used to convey material catch from the furnace's electrostatic precipitator to the raw material storage silos. Baghouse #1 controls emissions from a surge tank and transfer point in the system.

Mfg / Model:	Nol-Tec / 238-84NT25
Rated Airflow:	1,500 acfm
Filtration Media:	263 ft^2 of 16 oz/yd^2 polyester
Cleaning System:	Reverse Airjet

Exhaust Configuration:	8" dia exhaust discharging ~100' above grade

5.g EP Dust Collection System / Baghouse #2 (*existing*). A pneumatic transfer system is used to convey material catch from the furnace's electrostatic precipitator to the raw material storage silos. Baghouse #2 controls emissions from a surge tank and transfer point in the system.

Mfg / Model:	Nol-Tec / 238-84NT25
Rated Airflow:	1,500 acfm
Filtration Media:	263 ft^2 of 16 oz/yd^2 polyester
Cleaning System:	Reverse Airjet
Exhaust Configuration:	8" dia exhaust discharging ~100' above grade

5.h Emergency Diesel Generator #1 (*modified*). A diesel engine driven electric generator used to provide emergency power to essential facility functions during interruptions of utility power.

Engine Make / Model:	Caterpillar / D3516 (s/n GZS00700)
Engine Power Rating:	2,885 bhp
Engine Fuel Consumption:	146.6 gal/hr (100% load)
Engine Mfg Date:	2005
NSPS/MACT:	- / ZZZZ
SCR System	Johnson Mathey / SCR-CG
Generator Make / Model:	Caterpillar (s/n 1HN00940)
Generator Power Rating:	2,000 kW
Exhaust Configuration:	16.5" dia exhaust discharging 58' above grade

ADP Application L-706. Cardinal proposes to remove the SCR system from the existing generator. The SCR system is not used during routine maintenance/testing and has rarely operated since the facility was constructed. Removal of the system will have minimal impact on actual NO_X emissions based on historic operation. The SCR system was not originally installed as a BACT measure, so removal does not constitute backsliding with regards to New Source Review requirements.

5.i Emergency Diesel Generator #2 (*new*). A diesel engine driven electric generator used to provide emergency power to essential facility functions during interruptions of utility power.

Engine Make / Model:	Caterpillar / C32
Engine Power Rating:	1,829 bhp
Engine Fuel Consumption:	87.4 gal/hr
Engine Mfg Date:	TBD (EPA Tier 2)
NSPS/MACT:	IIII / ZZZZ
Generator Make / Model:	Caterpillar
Generator Power Rating:	1,250 kW
Exhaust Configuration:	13" dia exhaust discharging 58' above grade

ADP Application L-706. Cardinal proposes to install a second diesel engine driven generator at the Winlock facility. The new generator will operate in tandem with the existing generator to provide emergency power to the facility. ADP Application L-706 cites the above Caterpillar package generator as a general specification for purposes of permitting. Final equipment selection has not been made.

5.j Miscellaneous Burners / Space Heaters (*new*). This emission unit encompasses a wide variety of natural gas fired maintenance burners, minor process heaters and air makeup heaters operating in support of glass production operations. Combined rated heat input for all equipment is 19.188 MMBtu/hr. Individual pieces of equipment are described below.

Facility Area	Unit Description	Unit Count	Unit Capacity (Btu/hr)
Cafeteria	Oven	1	70,000
	Range	1	191,000
	Charbroiler	1	50,000
	Griddle	1	80,000
	Fryers	2	180,000
Warehouse/Cold End	Unit Heater 2	22	250,000
	Rooftop Unit 11	1	120,000
Cold End Addition	HVAC-1 Heater/Cooler	1	80,000
	Unit Heater 1	1	100,000
Office	Rooftop Unit 4	1	80,000
	Rooftop Unit 5	1	120,000
	Rooftop Unit 6	1	120,000
	Rooftop Unit 7	1	60,000
	Rooftop Unit 8	1	80,000
	Rooftop Unit 9	1	60,000
	Rooftop Unit 10	1	150,000
	Rooftop Unit 12	1	60,000
	Water Heater 3	1	75,000
Shop/Utility Room	Rooftop Unit 3	1	120,000
	Unit Heater 6	1	250,000
	Unit Heater 5	3	175,000
Generator/Substation Room	Unit Heater 7	3	100,000
SO_2/Water Meter Building	Unit Heater 8	1	25,600
	Unit Heater 9	1	25,600
Hot End Control Room	Rooftop Unit 1	1	120,000
	Rooftop Unit 2	1	120,000
Batch House	Unit Heater 1st Floor	1	400,000
	Unit Heater 4LX60	2	200,000
Maintenance Heaters	Shotgun Burners	2	705,000
	Shotgun Burners	8	412,000
	Shotgun Burners	2	2,420,000

ADP Application L-706. The original permit for this facility (PSD 03-03) did not directly address small pieces of secondary support equipment. Most of the cited equipment has been in use since the facility commenced operation. Cardinal proposes to formally account for this equipment in order to provide a comprehensive calculation of potential emissions in support of a minor source determination. Potential emission calculations assume maximum annual heat input of 61.2 MMBtu/yr. All the identified units operate on a limited basis. Actual heat input is expected to be significantly less.

5.k Insignificant Emission Units. The following pieces of facility equipment have been determined to have insignificant emissions, and are not registered as emission units:

- Dust Collector / Raw Materials Elevator – Top. The raw materials elevator conveys raw materials to the top of the storage silos/bins at a maximum rate of 300 tph. The elevator top dust collector is used in conjunction with equipment enclosure to control dust emissions from raw material transfer between the top of the elevator and the rotary distributor for the storage silos. *This unit originally exhausted to the ambient atmosphere. The unit was blinded off in September 2013.*

Mfg / Model:	JBD / DF110R
Rated Airflow:	324 acfm
Filtration Area / Media:	108 ft^2 (8 oz/yd^2 spun bond polyester filter cartridge)
Cleaning System:	Reverse Pulse-jet

- Dust Collector / Cullet Elevator - Top. The cullet elevator conveys cullet from the flat storage area to the storage bins in the batch house at a maximum rate of 150 tph. The top dust collector is used in conjunction with equipment enclosure to control dust emissions from cullet transfer between the top of the elevator and the batch house storage bins. *This unit originally exhausted to the ambient atmosphere. The unit was blinded off in September 2013.*

Mfg / Model:	JBD / DF110R
Rated Airflow:	324 acfm
Filtration Area / Media:	108 ft^2 (8 oz/yd^2 spun bond polyester filter cartridge)
Cleaning System:	Reverse Pulse-jet

- Natural gas metering station;
- Hydrogen storage and vaporization plant;
- On-site nitrogen generation, storage and vaporization plant;
- Re-circulated water system including cooling tower & storage tank
- Fire protection water storage tank and pump.

5.1 Equipment/Activity Summary.

ID No.	Generating Equipment/Activity	# of Units	Control Measures	# of Units
1	Glass Furnace / Annealing Lehr	1	Selective Catalytic Reduction, Spray Dryer Electrostatic Precipitator Low Sulfur Fuel (Nat Gas)	1
2	Glass Cutting Operations	N/A	Restriction on Material Type and Use	N/A
3	Cullet Return System #1	N/A	Process Enclosure, Fabric Filtration (Donaldson – 41,500 acfm)	1
4	Cullet Return System #2	N/A	Process Enclosure, Fabric Filtration (Carothers/Son – 25,000 acfm)	1
5	EP Dust Collection System #1	N/A	Process Enclosure, Fabric Filtration (Nol-Tec – 1,500 acfm)	1
6	EP Dust Collection System #2	N/A	Process Enclosure, Fabric Filtration (Nol-Tec – 1,500 acfm)	1
7	Emergency Generator #1 (Caterpillar – 2,885 bhp)	1	Low Sulfur Fuel (≤ 0.0015% by wt), Operating Limit (≤ 50 hr/yr)	N/A
8	Emergency Generator #2 (Caterpillar – 1,829 bhp)	1	Low Sulfur Fuel (≤ 0.0015% by wt), Operating Limit (≤ 50 hr/yr)	N/A
9	Misc. Burners/Space Heaters	67	Low Sulfur Fuel (Nat Gas)	N/A

6. EMISSIONS DETERMINATION

Emissions to the ambient atmosphere from the glass production and handling operations proposed in ADP Application L-706 consist of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM) sulfur dioxide (SO_2), toxic air pollutants (TAPs), and hazardous air pollutants (HAPs).

6.a Glass Furnace / Annealing Lehr (*modified*). Potential emissions from glass production are calculated from maximum glass production of 750 tpd, maximum natural gas consumption of 248 MMBtu/hr (Furnace - 231 MMBtu/hr, Reheater – 17.0 MMBtu/hr), emission test data from similar glass plants, emission limits proposed by the applicant, and emission factors from EPA AP-42. Emission calculations assume 8,640 hr/yr of regular operation and 120 hr/yr of control equipment maintenance. Annual emissions will be calculated from actual production, fuel use and CERMS data.

NO_X emissions are controlled by an SCR system with a minimum rated control efficiency of 80%. CO and VOC emissions are minimized with proper combustion controls and operation of the furnace in an oxidizing mode. PM and SO_2 emissions are controlled with an ESP/Spray Dryer combination.

All PM emissions are assumed to be $PM_{2.5}$. Emission factors for TAP and HAP compounds from natural gas combustion (AP-42, Tables 1.4-3 and 1.4-4) with a quality rating of "D" or "E" were not included in calculations due to the general unreliability of the data, and/or the questionable applicability of the data to this source.

			Emissions	
Pollutant		Emission Factor*	Lb/hr	Tpy
NO_X				245.00
	Normal Operation	1.63 lb/ton$_g$ (30-day)	101.8 (24-hr)	
	SCR Maintenance	-	415.6 (24-hr)	
CO		1.8 lb/ton$_g$ (30-day)	112.6 (24-hr)	246.38
VOC		0.1 lb/ton$_g$ (1-hr)	3.1 lb/hr (1-hr)	13.69
SO_2				114.19
	Normal Operation	0.8 lb/ton$_g$ (30-day)	25.0 (24-hr)	
	ESP/SD Maintenance	-	103.1 (24-hr)	
$PM_{10}/PM_{2.5}$ (f)				61.69
	Normal Operation	0.45 lb/ton$_g$ (1-hr)	14.1 (1-hr)	
	ESP/SD Maintenance		15.6 (1-hr)	
$PM_{10}/PM_{2.5}$ (t)		0.94 lb/ton$_g$ (1-hr)	29.4 (1-hr)	128.66
CO_2e		1171 lb/ton$_g$	36,594	160,281
TAPs (total)				20.00
HAPs (total)				3.43
Ammonia		0.07 lb/ton$_g$ (1-hr)	2.19 (1-hr)	9.58
Hydrogen Fluoride		0.022 lb/ton$_g$	0.69	2.01
Sulfuric acid		0.051 lb/ton$_g$	1.57	6.98

Pollutant	Emission Factor*	Emissions Lb/hr	Emissions Lb/yr
Arsenic	645 ppmw (PM)	0.019	165.6
Barium	4.3137E-6 lb/MMBtu	0.00107	9.4
Beryllium	1.1765E-8 lb/MMBtu	0.000003	0.03
Benzene	2.06E-6 lb/MMBtu	0.00051	4.5
Cadmium	840 ppmw (PM)	0.0247	216.4
Chromium (total)	630 ppmw (PM)	0.0185	162.1
Cobalt	8.2353E-8 lb/MMBtu	0.00002	0.2
Copper	8.3E-7 lb/MMBtu	0.00021	1.8
Formaldehyde	7.35E-5 lb/MMBtu	0.0182	159.7
Lead	297 ppmw (PM)	0.0087	76.2
Manganese	3.7255E-7 lb/MMBtu	0.000092	0.8
Mercury	2.549E-7 lb/MMBtu	0.000063	0.55
Molybdenum	1.0784E-6 lb/MMBtu	0.00027	2.3
Nickel	190 ppmw (PM)	0.005	49.1
Selenium	2.3529E-8 lb/MMBtu	0.000006	0.05
Toluene	3.33E-6 lb/MMBtu	0.00083	7.2
Vanadium	2.25E-6 lb/MMBtu	0.00056	4.9

* ton_g is an abbreviation for ton of glass drawn.

ADP Application L-706. As originally approved, the furnace at this facility had a nominal capacity of 650 tpd and utilized the 3R Process for NO_X control. Cardinal proposes to increase nominal capacity to 750 tpd and replace the 3R Process with an SCR system. The proposed project will decrease annual emissions of NO_X and CO and increase annual emissions of VOC, SO_2 and PM. BACT emission limits (lb/ton_g) will decrease for NO_X and CO, increase for SO_2, and remain the same for VOC and PM.

The new SCR system will be installed between the existing ESP and furnace exhaust stack. The configuration and design of the furnace and lehr will not be changed by this project. Existing control equipment will not be modified. According to Cardinal, secondary operations at the facility are capable of supporting the increased production rate so secondary emissions associated with increased furnace production are assumed to be negligible.

6.b Glass Cutting (*existing*). Potential emissions from glass cutting operations are calculated from maximum lubricant consumption of 7,317 pounds per month, material content data from the vendor and material balance methodology. Benzene content of the lubricant is specified as no greater than 1 ppmw. Annual emissions will be calculated from actual material consumption.

Pollutant	Emissions	
VOC	10.0 lb/hr	43.90 tpy
Benzene	--	0.09 lb/yr

6.c Material Handling Systems – Dust Collectors (*existing*). The proposed cullet return system will operate in similar fashion to existing dust collection systems at the facility. Emissions from each dust collector are calculated from rated discharge, a maximum emission concentration of 0.005 gr/dscf, and 8,760 hr/yr of operation. All PM emissions are assumed to be PM_{10}. $PM_{2.5}$ emissions are assumed to be 53% of PM_{10} emissions (EPA PM Calculator Ver 2.0 / SCC-30703099). Annual emissions will be calculated from actual hours of operation.

Dust Collector	Pollutant	Discharge Rate (cfm)	Emission Factor	Operation (hrs)	Emissions (lb/hr)	Emissions (tpy)
Cullet Return BH #1	PM/PM_{10}	41,500	0.005 gr/dscf	8,760	1.78	7.79
	$PM_{2.5}$		53% PM		0.94	3.90
Cullet Return BH #2	PM/PM_{10}	25,000	0.005 gr/dscf	8,760	1.07	4.69
	$PM_{2.5}$		53% PM		0.57	2.35
EP Dust Baghouse #1	PM/PM_{10}	1,500	0.005 gr/dscf	8,760	0.064	0.28
	$PM_{2.5}$		53% PM		0.034	0.14
EP Dust Baghouse #2	PM/PM_{10}	1,500	0.005 gr/dscf	8,760	0.064	0.28
	$PM_{2.5}$		53% PM		0.034	0.14

6.d Diesel Engine – Emergency Generator #1 (*modified*). Potential emissions from diesel engine operation are calculated from the emission factors listed below and hours of operation. Emission factors for all pollutants other than SO_2 are taken from manufacturer's data. SO_2 emission rates are calculated from EPA AP-42, Table 3.4-1 assuming a maximum fuel sulfur content of 0.0015% sulfur, a specific fuel consumption of 146.6 gal/hr, and a diesel heat content of 140,000 Btu/gal. All PM emissions are assumed to be $PM_{2.5}$. Annual emissions will be calculated from actual hours of operation using the emission factors identified below.

Hours of Operation = 50 hours

Pollutant	EF lb/hr	Emissions tpy	EF Source
NO_X	40.56	1.01	Manufacturer
CO	4.15	0.10	Manufacturer
VOC	1.08	0.03	Manufacturer
SO_X as SO_2	0.030	0.001	Mass Balance
PM/PM_{10}	0.91	0.02	Manufacturer
$PM_{2.5}$	0.91	0.02	Manufacturer
Total GHG - CO_2e	3,313	82.83	40 CFR 98

ADP Application L-706. As originally approved, Emergency Generator #1 was equipped with an SCR catalyst system for NO_X control. The requirement to install NO_X controls was prompted by visibility concerns and was not a BACT measure. The catalyst system does not function during routine maintenance and has rarely operated since installation. The proposed project will reduce facilitywide NO_X emissions to levels where there are no visibility concerns, so Cardinal has requested removal of the catalyst requirement. SWCAA has agreed to remove the requirement as part of this permitting action.

The original approval for Emergency Generator #1 limited maintenance and testing operation to a maximum of 200 hr/yr. Cardinal has voluntarily requested a reduction of the maintenance and testing limit to 50 hr/yr.

6.e Diesel Engine – Emergency Generator #2 (*new*). Potential emissions from diesel engine operation are calculated from the emission factors listed below and hours of operation. Emission factors for all pollutants other than SO_2 are calculated from manufacturer's data and/or EPA Tier limits. SO_2 emission rates are calculated from EPA AP-42, Table 3.4-1 assuming a maximum fuel sulfur content of 0.0015% sulfur. All PM emissions are assumed to be $PM_{2.5}$. Annual emissions will be calculated from actual hours of operation using the emission factors identified below.

Hours of Operation = 50 hours
Fuel Consumption = 87.4 gal/hr

Pollutant	EF lb/1000 gal	Emissions lb/hr	tpy	EF Source
NO_X	284.9	24.90	0.62	Manufacturer
CO	5.1	0.45	0.01	Manufacturer
VOC	2.4	0.21	0.005	Manufacturer
SO_X as SO_2	--	0.02	0.0005	Mass Balance
PM/PM_{10}	0.6	0.05	0.001	Manufacturer
$PM_{2.5}$	0.6	0.05	0.001	Manufacturer
Total GHG - CO_2e	22,600	1,975	49.38	40 CFR 98

ADP Application L-706. Cardinal proposes to install a new diesel engine driven emergency generator. The engine will be certified to Tier 2 emission standards as required by current EPA regulations. Cardinal has voluntarily requested a reduction of the maintenance and testing limit to 50 hr/yr.

6.f Miscellaneous Burners/Space Heaters (*New*). Potential emissions from burner and space heater operation are calculated from a combined rated heat input of 19.188 MMBtu/hr, 61,200 MMBtu/yr of natural gas consumption and emission factors from EPA AP-42 §1.4 "Natural Gas Combustion" (3/98). All PM is assumed to be $PM_{2.5}$.

Heat Input = 19.188 MMBtu/hr
Gas Consumption = 61,200 MMBtu

Pollutant	EF lb/MMBtu	Emissions lb/hr	tpy	
NO_X	0.098	1.88	3.00	
CO	0.082	1.57	2.51	
VOC	0.0054	0.10	0.17	
SO_2	0.0006	0.01	0.02	
$PM/PM_{10}/PM_{2.5}$	0.0075	0.14	0.23	
CO_2e	117.65	2,257	3,600	
Benzene	2.06E-06	0.00004	0.13	lb/yr
Formaldehyde	7.35E-05	0.00141	4.50	lb/yr

ADP Application L-706. As noted in Section 5, secondary burners and space heaters were not previously addressed by either of the facility's permits. Potential emission calculations use basic AP-42 emission factors for natural gas combustion and limited fuel consumption as proposed by Cardinal.

6.g Emissions Summary/Facilitywide Potential to Emit. Facilitywide potential to emit as calculated in the sections above is summarized below.

Pollutant	Emissions	Incremental Increase
NO_X	249.62 tpy	-583.05 tpy
CO	249.00 tpy	-522.48 tpy
VOC	57.79 tpy	1.92 tpy
SO_2	114.21 tpy	41.75 tpy
PM	141.96 tpy	16.84 tpy
PM_{10}	141.96 tpy	16.84 tpy
$PM_{2.5}$	141.96 tpy	16.84 tpy
HAP	3.43 tpy	2.63 tpy
TAP	20.00 tpy	9.41 tpy
CO_2e	164,013 tpy	21,371 tpy

Pollutant	CAS Number	Category	Facilitywide Emissions (lb/yr)	Incremental Increase (lb/yr)	WAC 173-460 SQER (lb/yr)
Ammonia	7664-41-7	TAP B	19,162.5	**19,162.5***	17,500
Arsenic	7440-38-2	HAP/TAP A	165.6	**16.7***	0
Barium	7440-39-3	TAP B	9.37	1.81	175
Beryllium	7440-41-7	HAP/TAP A	0.03	**0.01***	0
Benzene	71-43-2	HAP/TAP A	4.7	1.2	20
Cadmium	7440-43-9	HAP/TAP A	216.4	**23.7***	0
Chromium (total)	N/A	HAP/TAP A	162.1	21.9	175
Cobalt	7440-48-4	HAP/TAP B	0.18	0.04	175
Copper	7440-50-8	TAP B	1.8	0.3	175
Formaldehyde	50-00-0	HAP/TAP A	164.2	**32.8***	20
Hydrogen Fluoride	7664-39-3	HAP/TAP B	6023	**211***	175
Lead	7439-92-1	HAP/TAP A	76.2	9.6	50
Nickel	7440-02-0	HAP/TAP A	49.1	**6.7***	0.5
Selenium	7782-49-2	HAP/TAP B	0.05	0.01	175
Sulfuric acid	7664-93-9	TAP B	13961	161	175
Toluene	108-88-3	HAP/TAP B	7.2	1.4	43,748

* Denotes a project specific emission increase that exceeds the SQER and requires modelling. See Section 9.

7. REGULATIONS AND EMISSION STANDARDS

Regulations that have been used to evaluate the acceptability of the proposed facility and establish emission limits and control requirements include, but are not limited to, the regulations, codes, or requirements listed below.

7.a 40 CFR 60.7 "Notification and Recordkeeping" requires that notification shall be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup. These requirements have been met by past reporting actions.

7.b 40 CFR 60.8 "Performance Tests" requires that emission tests be conducted according to test methods approved in advance by the permitting authority and a copy of the results be submitted to the permitting authority.

7.c 40 CFR 60, Subpart CC "Standards of Performance for Glass Manufacturing Plants" applies to any glass melting furnace that commences operation after June 5, 1979. The Glass Furnace at this facility is subject to this requirement.

7.d 40 CFR 60, Subpart IIII "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" applies to each compression ignition (CI) internal combustion engine (ICE) that commences construction after July 11, 2005 and is manufactured after April 1, 2006, or that is modified or reconstructed after July 11, 2005. This regulation is applicable to the power unit for Emergency Generator #2, but is not applicable to the power unit for Emergency Generator #1 because it was manufactured prior to April 1, 2006.

7.e 40 CFR 61, Subpart N "National Emissions Standards for Hazardous Air Pollutants for Inorganic Arsenic Emissions from Primary Copper Smelters" applies to each glass melting furnace that uses commercial arsenic as a raw material. The Glass Furnace at this facility does not use commercial arsenic as a raw material. Therefore, this regulation is not applicable.

7.f 40 CFR 63, Subpart ZZZZ "National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" applies to each new and existing stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. The power unit for Emergency Generator #1 is classified as an existing compression ignition (CI) stationary RICE. The power unit for Emergency Generator #2 is classified as a new compression ignition (CI) stationary RICE.

7.g 40 CFR 63, Subpart SSSSSS "National Emissions Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources" applies to each existing or new affected glass melting furnace that is located at a glass manufacturing facility and satisfies the requirements specified in paragraphs 40 CFR 63.11449(a). The glass production process at this facility does not use a "glass manufacturing metal HAP" in its batch formulation. Therefore, this regulation is not applicable.

7.h 40 CFR 64 "Compliance Assurance Monitoring" requires the owner or operator of selected pollutant specific emission units at a major stationary source to develop and implement a monitoring plan that provides a reasonable assurance of compliance with applicable emission limitations or standards. These units are generally characterized as having uncontrolled potential to emit > 100 tpy and using a control device to comply with applicable emission standards. This regulation is applicable to the glass melting furnace at this facility.

7.i 40 CFR 68 "Chemical Accident Prevention Provisions" requires affected stationary sources to compile and submit a risk management plan, as provided in Sections 68.150 to 68.185. Applicability is determined by the type and quantity of material stored at the facility. This regulation could potentially be applicable to this facility due to the storage of large quantities of hydrogen gas and/or sulfur dioxide. However, the storage capacity for both of these compounds is less than the applicable threshold so the regulation is not applicable.

7.j Revised Code of Washington (RCW) 70A.15.2040 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such orders as may be necessary to effectuate the purposes of the Washington Clean Air Act [RCW 70A.15] and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess.

7.k RCW 70A.2210 provides for the inclusion of conditions of operation as are reasonably necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing an Air Discharge Permit for installation and establishment of an air contaminant source.

7.l Washington Administrative Code (WAC) 173-401 "Operating Permit Regulation" requires all major sources and other sources as defined in WAC 173-401-300 to obtain an operating permit. This source is a major source, so this regulation is applicable.

7.m WAC 173-442 "Clean Air Rule" establishes GHG emissions standards starting in 2017 for certain stationary sources, petroleum product producers/importers, and natural gas distributors. The proposed facility will have covered GHG emissions in excess of the thresholds listed in WAC 173-442-030. Therefore, this regulation is applicable to this facility. Implementation of the regulation will be carried out by the Department of Ecology.

7.n WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety. SWCAA implements WAC 173-460 as in effect on August 21, 1998.

7.o WAC 173-476 "Ambient Air Quality Standards" establishes ambient air quality standards for PM_{10}, $PM_{2.5}$, lead, sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide in the ambient air, which shall not be exceeded.

7.p SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.

7.q SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.

7.r SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing sources not emit particulate matter in excess of 0.1 grains per dry standard cubic foot of exhaust gas.

7.s SWCAA 400-091 "Voluntary Limits on Emissions" allows sources to request voluntary limits on emissions and potential to emit by submittal of an ADP application as provided in SWCAA 400-109. Upon completion of review of the application, SWCAA shall issue a Regulatory Order that reduces the source's potential to emit to an amount agreed upon between SWCAA and the permittee. The voluntary modifications proposed by Cardinal will lower facility emissions to levels below major source thresholds. Cardinal has requested that SWCAA issue enforceable permit limits to make the facility a synthetic minor source.

7.t SWCAA 400-109 "Air Discharge Permit Applications" requires that an Air Discharge Permit application be submitted for all new installations, modifications, changes, or alterations to process and emission control equipment consistent with the definition of "new source". Sources wishing to modify existing permit terms may submit an Air Discharge Permit application to request such changes. An Air Discharge Permit must be issued, or written confirmation of exempt status must be received, before beginning any actual construction, or implementing any other modification, change, or alteration of existing equipment, processes, or permits.

7.u SWCAA 400-110 "New Source Review" requires that SWCAA issue an Air Discharge Permit in response to an Air Discharge Permit application prior to establishment of the new source, emission unit, or modification.

7.v SWCAA 400-113 "Requirements for New Sources in Attainment or Nonclassifiable Areas" requires that no approval to construct or alter an air contaminant source shall be granted unless it is evidenced that:

(1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;

(2) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
(3) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
(4) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

8. RACT/BACT/BART/LAER/PSD/CAM DETERMINATIONS

The proposed equipment and control systems incorporate Best Available Control Technology (BACT) for the types and amounts of air contaminants emitted by the processes as described below:

8.a BACT Determination – Glass Furnace / Annealing Lehr (*modified*). The use of the following control measures has been determined to meet the requirements of BACT for the Glass Furnace / Annealing Lehr at this facility:

NO_X – Selective catalytic reduction system with ammonia injection capable of reducing NO_X emissions by a minimum of 80%. Such control measures include operation, monitoring and maintenance provisions for the ammonia injection system such that stack emissions of ammonia will not exceed 10 ppmvd @ 15% O_2 (24-hr avg).

CO/VOC – Proper combustion controls.

SO_2 – Low sulfur fuel and spray dryer system using a sodium carbonate solution.

PM – Electrostatic precipitator.

8.b BACT Determination – Emergency Generator / Fire Pump (*new*). The use of a modern diesel engine design (EPA Tier 2), limited hours of operation (testing, maintenance, and emergency use only), and ultra-low sulfur distillate fuel (less than 0.0015% sulfur by weight) has been determined to meet the requirements of BACT for emergency generators at this facility. The proposed generator engine is certified to EPA Tier 2 standards. There are similar engines available certified to higher EPA Tier standards, but 40 CFR 60 Subpart IIII does not require their use for emergency applications. In addition, catalyst systems associated with higher Tier certifications do not provide significant emission reductions for the proposed operating scheme.

8.c BACT Determination – Misc. Burners / Space Heaters (*new*). The use of combustion equipment that fires a low sulfur fuel (natural gas) and limits visible emissions to 0% opacity or less has been determined to meet the requirements of BACT for miscellaneous burners and space heaters at this facility.

Other Determinations

8.d Prevention of Significant Deterioration (PSD) Applicability Determination: This permitting action was reviewed by the Washington State Department of Ecology (Ecology) for potential PSD applicability. Ecology determined that PSD was not applicable. Ecology also determined the facility will qualify as a minor stationary source after this permitting action.

8.e Compliance Assurance Monitoring (CAM) Applicability Determination. With some exceptions, CAM is applicable to any emissions unit with the potential to emit (pre-controlled) 100 tons per year or more of any criteria air pollutant for which an emission standard (limit) applies, and that utilizes a control device to maintain compliance with the emission standard.

The Glass Furnace at this facility is potentially subject to CAM for emissions of NO_X, SO_2 and PM. NO_X and SO_2 emissions are monitored with continuous monitoring systems so CAM is not applicable. CAM requirements for PM are met through the use of a CAM plan that monitors ESP operating parameters.

9. AMBIENT IMPACT ANALYSIS

9.a Tap Small Quantity Review. The incremental increases in TAP emissions associated with this permitting action are quantified in Section 6 of this Technical Support Document. All incremental increases in individual TAP emissions are less than the applicable small quantity emission rate (SQER) identified in WAC 173-460 (effective 8/21/98) with the exception of the pollutants listed below.

Incremental increases in pollutant emissions were modeled using EPA's AERSCREEN dispersion model. The results of the model indicate that the project will not cause an incremental increase in ambient concentrations greater than the applicable acceptable source impact level (ASIL) identified in WAC 173-460 (effective 8/21/98).

Toxic Compound	CAS #	Incremental Ambient Impact ($\mu g/m^3$)	Acceptable Source Impact Level ($\mu g/m^3$)
Ammonia	7664-41-7	0.25 (24-hr)	100 (24-hr)
Arsenic	7440-38-2	0.00001 (Annual)	0.00023 (Annual)
Beryllium	7440-41-7	0.000000008 (Annual)	0.00042 (Annual)
Cadmium	7440-43-9	0.00002 (Annual)	0.00056 (Annual)
Formaldehyde	50-00-0	0.00003 (Annual)	0.077 (Annual)
Hydrogen Fluoride	7664-39-3	0.003 (24-hr)	8.7 (24-hr)
Nickel	7440-02-0	0.000006 (Annual)	0.0021 (Annual)

Conclusions

9.b Modification of the Winlock flat glass manufacturing plant, as proposed in ADP Application L-706, will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.

9.c Modification of the Winlock flat glass manufacturing plant, as proposed in ADP Application L-706, will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" (as in effect 8/21/98) or WAC 173-476 "Ambient Air Quality Standards" to be violated.

9.d Modification of the Winlock flat glass manufacturing plant, as proposed in ADP Application L-706, will not cause a violation of emission standards for sources as established under SWCAA General Regulations Sections 400-040 "General Standards for Maximum Emissions," 400-050 "Emission Standards for Combustion and Incineration Units," and 400-060 "Emission Standards for General Process Units."

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue ADP 20-3409 in response to ADP Application L-706. ADP 20-3409 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

10.a Supersession of Previous Permits. ADP 20-3409 supersedes ADP 04-2568R2 in its entirety. After issuance of ADP 20-3409 and successful demonstration of minor source status, Ecology is expected to rescind PSD 03-03-A2.

10.b General Basis. Permit requirements for equipment affected by this permitting action incorporate the operating schemes proposed by the applicant in ADP Application L-706. Permit requirements established by this action are

intended to implement BACT, minimize emissions, and assure compliance with applicable requirements on a continuous basis. Emission limits for approved equipment are based on the maximum potential emissions calculated in Section 6 of this Technical Support Document.

10.c Monitoring and Recordkeeping Requirements. ADP 20-3409 establishes monitoring and recordkeeping requirements sufficient to document compliance with applicable emission limits, ensure proper operation of approved equipment and provide for compliance with generally applicable requirements.

10.d Reporting Requirements. ADP 20-3409 establishes general reporting requirements for annual air emissions, upset conditions and excess emissions. Specific reporting requirements are established for hours of operation, fuel consumption, material consumption, glass production, and emission test results. Reports are to be submitted on a quarterly basis.

10.e Raw Materials Handling (*existing*). Permit requirements for raw materials handling focus on full or partial enclosure of handling equipment such as elevators, conveyor belts, and storage silos/bins. All major sources of fugitive dust are controlled via dust collectors. Visible emissions from dust collector exhaust are limited to 0% opacity. There are no restrictions on equipment operation.

10.f Glass Furnace / Annealing Lehr (*modified*). Permit requirements for the Glass Furnace establish comprehensive emission limits for criteria pollutants. Emissions of NO_X, SO_2, and PM will be controlled through the use of add-on control technology. CO and VOC emissions are controlled through good combustion practices. A CEMS is in use to monitor exhaust flowrate and emissions of NO_X, CO and SO_2. Periodic emission testing will be required for the purposes of assuring ongoing compliance and certifying the accuracy of the emission monitoring systems. Annual emissions will be calculated from monitoring results, emission test data and actual operation. Approval conditions for this unit also incorporate applicable requirements from 40 CFR 60, Subpart CC.

10.g Glass Cutting Operations (*existing*). Permit requirements for glass cutting operations restrict both the amount and the type of mineral spirits that can be used as a cutting lubricant. The BACT determination for this facility includes a monthly consumption limit and a benzene material content limit for the cutting lubricant. Compliance with the consumption limit is based on material records kept by the facility. Cardinal's application specifically proposed the use of "Odorless Mineral Spirits" as a lubricant. According to vendor's data, the specifications for this product are drawn from the Type 3C specifications of ASTM D-235. SWCAA's original T-BACT determination has incorporated the Type 3C specifications because the resulting product has a relatively low aromatic content ($\leq$ 0.5% by wt) when compared with other mineral spirit mixtures.

10.h Glass Packaging and Storage (*existing*). Emissions from glass storage are negligible. Emissions from glass packaging primarily consist of fugitive dust from packing equipment and broken glass handling. Permit requirements for glass packaging focus on full or partial enclosure of the handling equipment (breakers, elevators, conveyors, etc.), and the use of dust collection systems to control ambient emissions. Visible emissions from dust collector exhaust are limited to 0% opacity. Periodic emission testing is required to ensure proper dust collector performance.

10.i Emergency Generators (*existing*). As proposed by the Cardinal, permit requirements are based on limited service restricted to actual emergencies and 50 hr/yr for each unit for the purpose of testing and maintenance. Emissions will be calculated based on applicable emission factors and annual operation as recorded and reported by the Cardinal. Visible emission limits have been established consistent with proper operation of the Caterpillar diesel engines, including provisions for start-up. The use of low sulfur diesel ($\leq$ 0.0015% S by weight) is required. Fuel supplier certifications will be referenced as proof that low sulfur fuel is in use.

11. START-UP AND SHUTDOWN/ALTERNATIVE OPERATING SCENARIOS/POLLUTION PREVENTION

11.a Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown", technology-based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

Emergency Generator Engines. Visible emissions from the emergency generator diesel engine power units are limited to 10% opacity or less during normal operation. However, the diesel engine may not be capable of reliably limiting visible emissions to less than 10% opacity until normal operating temperature is achieved. Therefore, the 10% opacity limit shall not apply to engine exhaust during start-up periods.

11.b Alternate Operating Scenarios. SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. The permittee did not propose or identify any applicable alternate operating scenarios. Therefore, none were included in the permit requirements.

Glass Furnace Control Equipment Maintenance. Control equipment associated with the Glass Furnace requires periodic maintenance. The control equipment must be by-passed to perform the required maintenance. Emissions of affected pollutants are uncontrolled during these maintenance periods. Permit conditions allow an annual maintenance period of up to 5 days in length for each individual control system (ESP/Spray Dryer, SCR System). Maintenance may be performed on both systems simultaneously or each system individually.

Glass Furnace Hot Fan Transition. The design of the Glass Furnace's hot fan ductwork results in elevated opacity levels whenever 'lead' status is alternated between the two hot fans. The increased opacity is caused by entrainment of dust accumulations in the ductwork due to disruptions in exhaust flow related to load transition. Cardinal has developed operational methods to minimize the impact of fan transitions, but cannot reliably comply with the regular visible emissions limit of 10% opacity. To accommodate this situation, the visible emission limit has been increased to 20% opacity for the duration of each fan transition.

11.c Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures were identified by either the permittee or SWCAA separate or in addition to those measures required under BACT considerations. Therefore, none were included in the permit requirements.

12. EMISSION MONITORING AND TESTING

12.a CEMS Audit Requirements – Glass Furnace. Permit requirements for the Glass Furnace require the installation and maintenance of a continuous emission monitoring system (CEMS) and data acquisition and handling system (DAHS) to monitor total flowrate and emission rates of NO_X, CO and SO_2 from the Glass Furnace exhaust stack. The CEMS must meet applicable audit requirements from 40 CFR 60, Appendices B and F. These requirements are summarized in ADP 20-3409, Appendix B.

12.b Emission Testing Requirements – Glass Furnace. Permit requirements for the Glass Furnace require periodic emission testing for VOC and PM for the purposes of demonstrating compliance with applicable emission limits. All emission testing shall be conducted in accordance with ADP 20-3409, Appendix A.

12.c Emission Testing Requirements – Cullet Return Baghouse #1. Permit requirements for Cullet Return Baghouse #1 require emission testing at least once every 36 months for the purpose of assuring compliance with applicable emission limits. All emission testing must be conducted in accordance with ADP 20-3409, Appendix C.

12.d Emission Testing Requirements – Cullet Return Baghouse #2. Permit requirements for Cullet Return Baghouse #2 require emission testing at least once every 60 months for the purpose of assuring compliance with applicable emission limits. Required emission tests must be conducted in accordance with ADP 20-3409, Appendix D.

12.e Emission Testing Requirements – Material Handling Baghouses. Routine PM emission testing of minor baghouses is not required by ADP 20-3409. Visible emissions (0% opacity) are used as a compliance surrogate. Permit provisions allow SWCAA to require reference method testing if excessive visible emissions are documented.

13. FACILITY HISTORY

13.a Previous Permitting Actions. SWCAA has previously issued the following Permits for Cardinal's facility in Winlock:

Date	Application Number	Permit Number	Purpose
12/13/2010	--	PSD 03-03-A2	Modification of approval conditions to allow uncontrolled emissions during an annual 5-day control equipment maintenance period.
12/16/2008	L-627	04-2568R2	Installation of Cullet Return Baghouse #2 and associated dust collection system. Modification of visible emission limits for Glass Furnace to allow higher visible emissions during lead hot fan transition.
2/14/2008	--	PSD 03-03-A1	Modification of permit terms to allow Glass Furnace compliance testing at less than 90% of daily glass draw capacity. A 90% relationship retained for glass draw at time of testing versus allowable operating capacity. PSD amendment considered administrative by Ecology.
9/26/2007	L-597	04-2568R1	Approval of two baghouses serving the material catch reclaim system on the Glass Furnace ESP. The affected baghouses were installed during initial facility construction, but not cited in the original air quality permits (PSD 03-03, ADP 04-2568).
10/6/2004	--	PSD 03-03	Installation of a flat glass manufacturing facility.
10/4/2004	L-524	04-2568	Installation of a flat glass manufacturing facility. Superseded by ADP 04-2568R1.

13.b Compliance Status. A search of source records on file at SWCAA did not identify any outstanding compliance issues at this facility.

14. PUBLIC INVOLMENT OPPORTUNITY

14.a Public Notice for ADP Application L-706. Public notice for ADP Application L-706 was published on the SWCAA internet website for a minimum of 15 days beginning on November 21, 2019.

14.b Public/Applicant Comment for ADP Application L-706. A 45-day public comment period was provided for this permitting action pursuant to SWCAA 400-171(3) beginning on May 8, 2020. SWCAA did not receive any comment from the applicant or the public during the public comment period for this permitting action.

14.c State Environmental Policy Act. Lewis County completed a SEPA review for this project. Lewis county issued a Determination of Nonsignificance on November 17, 2020 (*SEP20-0024*).