Engineering Evaluation
Bayer US LLC
800 Dwight Way, Berkeley, California 94710
Plant Number 12071
Application No. 32196

Background

Bayer US LLC (Bayer) has applied for an Authority to Construct and Permit to Operate for the following operations:

S-60 Wipe Cleaning Operation, Building 68
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 2.02 gal/day
Maximum Annual Throughput: 736 gal/year

S-61 Wipe Cleaning Operation, Building 69
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 4.80 gal/day
Maximum Annual Throughput: 1,752 gal/year

S-62 Wipe Cleaning Operation, Building 88
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 2.02 gal/day
Maximum Annual Throughput: 736 gal/year

And modify

S-13 Facility Wide Wipe Cleaning Operation
70% Isopropyl Alcohol-30%Water Solvent Mixture
Building 28A Maximum Throughput: 7.9 gal/day, 21 gal/year
Building 53 Maximum Throughput: 5.2 gal/day, 32 gal/year
Building 57/57A Maximum Throughput: 6.8 gal/day, 53 gal/year
Building 59 Maximum Throughput: 4.2 gal/day, 158 gal/year
Building 60 Maximum Throughput: 42.8 gal/day, 2,953 gal/year
Building 66 Maximum Throughput: 26.2 gal/day, 738 gal/year
Building 80 Maximum Throughput: 4.5 gal/day, 105 gal/year
Building 81 Maximum Throughput: 171.3 gal/day, 3,838 gal/year

Bayer is opening a pharmaceutical research & development facility and is proposing to use new Wipe Cleaning Operations in three new buildings (68, 69, and 88). Bayer is also proposing to modify the existing S-13 Facility Wide Wipe Cleaning Operation to remove buildings 5A, 49, 49A, 50, and 55. Hourly throughputs were reduced at buildings 28A and 53, while daily throughputs were increased at buildings 57/57A, 59, 60, 66, 80, and 81. Wipe cleaning operations occur throughout the buildings and include surface disinfection of shoes, safety glasses, work surfaces, door handles, raw material packaging, and handheld tools. Wipe cleaning is accomplished by transferring the solvent from a controlled flow dispenser onto a surface and using wipes to clean the surface area of concern, in addition to pre-packaged wipes. Used wipes are disposed of in covered medical waste containers and managed as hazardous waste.

The proposed solvent is a solution consisting of 70% isopropyl alcohol (IPA) by weight and 30% water by weight. Bayer indicated they can only use IPA since it is required to meet the United States Food and Drug Administration (US FDA) standards. They cannot use any other solvent or alternate products.

Emission Calculations

The proposed wipe cleaning operations (S-13, S-60, S-61, and S-62) will emit precursor organic compounds (POC) and toxic air contaminants (TAC). Solvent density and composition information from the provided safety data sheets (SDS) for the proposed solvent will be used to calculate the emission rates. No add-on controls of emissions are proposed.

The facility plans to use the wipe cleaning operation continuously, so the maximum operating hours are assumed to be 24 hours/day, 365 days/year. Each operating area within Bayer's pharmaceutical development and manufacturing buildings is classified by a cleanliness grade. These grades are assigned to tightly control the environmental conditions during different drug manufacturing operations. Within each building, the various area classifications have different sanitization schedules ranging from quarterly to weekly or daily. In addition to a complex sanitization schedule, Bayer must also respond to dynamic conditions in the facility. Changing environmental conditions can prompt a need for additional sanitization to ensure a sterile pharmaceutical manufacturing environment. The scope and frequency of additional sanitization vary depending on the circumstances. This is a highly dynamic environment, and as a result, the amount of isopropyl alcohol used for wipe cleaning can vary greatly from one day to the next.

For a conservative estimate of daily and hourly emissions, it will be assumed that 100% of solvent usage will be emitted into the atmosphere. The table below provides the technical data of the product used.

Table 1. Product Technical Data

Product Use Type	Product Name	Product Code	Components	% w/w	POC Content (lb/gal)
Wipe Cleaning	PROCESS2WIPE IPA70	VEL-038	Isopropanol	70%	6.55

The table below shows the proposed max throughput for each source.

Table 2. Solvent Throughput Information for Wipe Cleaning Operations

Source	Building Number	Max Hourly Throughput (gal/hour)	Max Daily Throughput (gal/day)	Max Annual Throughput (gal/year)
13	28A	0.33	7.9	21
	53	0.22	5.2	32
	57/57A	0.28	6.8	53
	59	0.17	4.2	158
	60	1.78	42.8	2,953
	66	1.09	26.2	738

	80	0.19	4.5	105
	81	7.14	171.3	3,838
S-13 Total		**11.20**	**268.8**	**7,898**
60	68	0.084	2.02	736
61	69	0.204	4.80	1,752
62	88	0.084	2.02	736

The method used for calculating total POC emission rates for S-13, S-60, S-61, and S-62 is as follows:

Basis:

1. Max hourly and max annual throughputs provided by the applicant.
2. Max daily throughputs = max hourly throughputs * 24 hours/day.
3. Max daily emissions rates = max hourly emissions rates * 24 hours/day.

Table 3. POC Emission Rates

Source #	Building #	Max Hourly Throughput (gal/hour)	Max Annual Throughput (gal/year)	Solvent Density	% w/w	Hourly Emission Rate (lb/hour)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/year)	Annual Emission Rate (ton/year)
13	28A	0.33	21	6.55	70%	1.50	36.0	96	0.048
	53	0.22	32			1.00	24.0	147	0.073
	57/57A	0.28	53			1.30	31.2	243	0.122
	59	0.17	158			0.80	19.2	724	0.362
	60	1.78	2,953			8.17	196.1	13,540	6.770
	66	1.09	738			5.00	120.0	3,384	1.692
	80	0.19	105			0.86	20.6	481	0.241
	81	7.14	3,838			32.73	785.5	17,597	8.799
S-13 Total		**11.20**	**7,898**			**51.36**	**1,232.6**	**36,212**	**18.106**
60	68	0.084	736			0.4	9.2	3,374	1.687
61	69	0.204	1,752			0.9	22.0	8,033	4.016
62	88	0.084	736			0.4	9.2	3,374	1.687
Project Total						**53.05**	**1,273.1**	**50,993**	**25.496**

Total volatile organic compound (VOC) emissions from S-13, S-60, S-61, and S-62 will not be allowed to exceed the POC emission rates calculated from the use of the proposed solvents. Therefore, total VOC emissions from S-13, S-60, S-61, and S-62 are also equivalent to POC emissions.

Application #27619 evaluated 7.11 lb/gal of solvent density vs. this application, which will use 6.55 lb/gal as the solvent density to match the default density of IPA used in the New Production System (NPS). Using the default density from NPS will ensure consistency with future permit applications. See Appendix C for S-13 pre-project and post-project changes.

Health Risk Assessment (HRA)

A project is subject to Regulation 2, Rule 5 if emissions of any toxic air contaminant (TAC) exceed the respective acute or chronic trigger level in Table 2-5-1 of Regulation 2, Rule 5. There are no related sources within the 5-year lookback period to include in the project.

Therefore, the project's TAC emissions include only the emissions from S-13, S-60, S-61, and S-62.

The TAC emissions were estimated using TAC compound contents from the SDS for each proposed solvent, along with proposed throughputs and the same operating schedule used to calculate POC emissions. The following table provides a summary of TAC emission rates from the wipe cleaning operation.

Table 4. Project Toxic Air Contaminant Emissions Review

Source	TAC	CAS #	Hourly Emission Rate (lbs/hr)	Acute Trigger Level (lbs/hr)	Annual Emission Rate (lbs/yr)	Chronic Trigger Level (lbs/yr)	Exceeds Acute Trigger Level?	Exceeds Chronic Trigger Level?
S-13	Isopropyl Alcohol	67-63-0	51.36	1.4	36,212	27,000	Yes	Yes
S-60	Isopropyl Alcohol	67-63-0	0.4	1.4	3,374	27,000	No	No
S-61	Isopropyl Alcohol	67-63-0	0.9	1.4	8,033	27,000	No	No
S-62	Isopropyl Alcohol	67-63-0	0.4	1.4	3,374	27,000	No	No
Total	Isopropyl Alcohol	67-63-0	1.7	1.4	14,781	27,000	Yes	No

As shown above, project TAC emissions exceed the acute trigger levels. Therefore, pursuant to Regulation 2-5-110, the project is subject to Regulation 2, Rule 5.

HRA Results

The HRA was conducted with the proposed hourly and annual limits. Results from this HRA indicate that the project chronic hazard index (HI) is estimated at 0.0017, and the project acute HI is estimated at 1.0. In accordance with the Air District's Regulation 2-5-301, none of these sources require TBACT because each estimated source cancer risk is less than 1.0 in a million and/or a chronic hazard index of 0.20.

To ensure Bayer does not exceed project risk limits, hourly emissions and throughput limits in Part 2 and hourly recordkeeping in Part 5 of Permit Condition #100677 will be imposed to ensure they remain below the acute HI 1.0 threshold.

Since the estimated project hazard indices do not exceed 1.0, this proposed project complies with the Air District's Regulation 2-5-302 project risk requirements for projects located in an Overburdened Community, as defined in Regulation 2-1-243.

Table 5. HRA Results

Maximally Exposed Receptor	Maximum Chronic Hazard Index	Maximum Acute Hazard Index
Residential	0.00066	NA
Off-site worker	0.0017	NA

Student (Ecole Bilingue De Berkeley Middle School)	0.00070	NA
Point Max Impact	NA	1.0

Best Available Control Technology (BACT)

Pursuant to Regulation 2-2-301, BACT shall apply to new or modified sources with a potential to emit (PTE) equal to or greater than 10 pounds per highest day of any criteria pollutant.

As shown in Table 3, the maximum daily emissions of POC for S-13 and S-61 exceed 10 lbs/day. Therefore, S-13 and S-61 are subject to BACT.

Per Section 2-2-202, BACT is defined as an emission limitation, control device, or control technique applied at a source that is the most stringent of:

- the most effective device or technique successfully utilized,
- the most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source,
- the most effective emission control limitation for the type of equipment comprising such a source that is contained in an approved implementation plan of any state, or
- the most effective control device or technique or most stringent emission limitation that is technologically feasible, taking into consideration cost-effectiveness, any ancillary health and environmental impacts, and energy requirements.

These requirements are generally categorized as either technologically feasible and cost-effective (termed "BACT 1") or achieved-in-practice (termed "BACT 2").

BACT 2 is either equal to or less stringent than BACT 1. Because achieved-in-practice is required regardless of cost and BACT 1 is more stringent than BACT 2, an evaluation for what has been achieved-in-practice is first conducted.

Achieved-in-Practice.

The Environmental Protection Agency's (EPA) BACT Clearinghouse and California Air Resources Board's (CARB) Clearinghouse did not have any determinations that were relevant to wipe cleaning operations occurring at pharmaceutical manufacturing facilities. South Coast Air Quality Management District (SCAQMD), Sacramento Metropolitan Air Quality Management District (SMAQMD), and San Diego Air Pollution Control District (SDAPCD) BACT determinations did not have any results for wipe cleaning operations.

San Joaquin Valley Air Pollution Control District (SJVAPCD) BACT Guideline 4.10.5 for "Solvent Wipe Cleaning – Medical Devices and Pharmaceuticals", dated 03/06/2024, identifies achieved in practice as complying with SJVAPCD Rule 4663. Table 1 of Rule 4663 outlines volatile organic compounds (VOC) content limits for organic solvents. Effective September 21, 2008, solvents used for cleaning and surface preparation for medical devices and pharmaceuticals must have a VOC content limit of less than 6.7 lb/gal. The IPA that Bayer uses in their wipe cleaning operation has a VOC content of 4.59 lb/gal, which is under the 6.7 lb/gal

limit specified by SJVAPCD's Rule 4663. Therefore, Bayer is expected to comply with what is achieved in practice by SJVAPCD.

Additionally, Achieved-in-practice BACT is presented in the current BAAQMD BACT/TBACT Workbook for Wipe Cleaning Operations, Document #179B.1, Revision 2, dated 02/04/1993. Achieved-in-practice BACT has been determined to be a good operating practice which includes minimizing the use of solvents, using of lowest practical vapor pressure solvents, using of controlled flow solvent dispensers (e.g., squeeze bottle), and all cloths/papers and solvents not in active use kept in closed containers.

Technologically Feasible and Cost-Effective.
The following control technologies and mitigation measures have been found technically feasible for abating POC emissions for wipe-cleaning operations:

- Wipe cleaning in a hood, booth, or room vented to a control device, w/ emissions controlled to overall capture/destruction efficiency >90%
- Control devices can be either a carbon adsorber or an afterburner

Although Regulation 2-2 does not include a definition for cost-effectiveness, Section 2-2-414 requires the Air District to publish and periodically update a BACT Workbook, and that BACT will be determined using the workbook as a guidance document. The Air District's BACT workbook was last updated in 1993 and would not reflect what is currently BACT. In reviewing BACT determinations from other air districts within California, San Joaquin Valley Air Pollution Control District (SJVAPCD) had a more recent BACT guideline established for this type of source and operation.

SJVAPCD BACT Guideline 4.10.5 for "Solvent Wipe Cleaning – Medical Devices and Pharmaceuticals" identifies 2 controls that are considered technologically feasible. The first option is to route POC emissions to a thermal oxidizer or activated carbon that has 98% overall capture (full enclosure, 100% capture). The second technologically feasible option is to route POC emissions to a thermal oxidizer or carbon abatement with 90% overall capture and control (partial enclosure via fume hood or equivalent).

Section 1 of the BACT Workbook includes a maximum cost guideline for POC emissions of $17,500 per ton of emissions reduced. A cost effectiveness analysis of the use of add-on controls for POC emissions at S-61 has been reviewed, which includes the use of a regenerative thermal oxidizer (RTO) with a concentrator. Carbon adsorption is also a potential emissions control device. The details of the control cost calculations and emission reductions for each of these options are presented in the attachments to this analysis as *Appendix A – BACT Cost Analysis*.

Because S-13 is a single source encompassing multiple buildings, it is technologically feasible to install controls at buildings each building that exceeds 10.0 lbs/day. However, because S-13 is a single source with combined emissions from multiple buildings, it would not be considered cost effective as the cost of installing, operating, and maintaining controls in each building easily exceeds the $17,500 cost effectiveness threshold for POC.

For S-61, it is technologically feasible for emissions from the wipe cleaning operation to be vented to a control device but it is not cost effective. The majority of wipe cleaning at the site is

used to sterilize room surfaces and equipment where pharmaceutical operations occur in accordance with practices approved by the FDA. Wipe cleaning performed at Bayer does not and cannot occur inside a hood or booth.

The ventilation in production areas at Bayer is highly controlled to achieve FDA approved air particle concentrations in order to minimize contamination. In many areas, particle concentrations must remain very low. In order to achieve this, the air exchange rate of production buildings is maintained at a level of at least five changes per hour, or higher. This results in a large volume of ventilation air being exhausted from each building. The elevated air ventilation rate also results in reduced concentrations of POC in the building exhaust. A zeolite concentrator could be used but would not be cost effective. The cost of the concentrator was accounted for in the cost analysis.

Carbon Adsorption
Bayer contacted vendors of carbon adsorption systems for quotes, and all vendors declined to provide quotes for a system that would need to handle 101,000 cfm of air to control 4.016 (S-61) tons/year or 8.799 tons/year (S-13 Building 81) of POC emissions. Carbon adsorption systems can use a maximum superficial bed velocity of 85 ft/min. Flows lower than this value are commonly used in practice. At velocities higher than 85 ft/min, the exhaust would pass through the bed too quickly and prevent adsorption onto the carbon media. For a 101,000 cfm system including a cylindrical tank of carbon, designed achieve a superficial bed velocity of 85 ft/min, the cross sectional radius would need to be:

Volume flow (cu ft/min) = Velocity (ft/min) x Area (sq ft)
101,000 cfm = 85 ft/min x Area (sq ft)
Area = 1,188 sq ft

Assuming the tank would need to be at least 5 feet tall to allow meaningful contact between exhaust POC and carbon, the total volume would be 5,961 cu ft (calculated as 1,188 sq ft x 5 ft). For a carbon bulk density of 30 lb/cu ft, the weight of this system would be 178,235 lbs (based on 5,961 cu ft x 30 lb/cu ft). In other words, the weight of the carbon alone would be 89 tons, without factoring in the additional weight from the tank and supporting equipment.

Using a tank of this size (89 tons of carbon, not including the weight of the tank) is considered technologically feasible. This system would not be cost effective to design, operate, and maintain.

RTO with Zeolite Concentrator
Bayer contacted vendors of thermal oxidation systems, and most vendors declined to provide quotes for a system that would need to handle 101,000 cfm of air to control 4.016 tons/year and 8.799 tons/year of POC emissions. One vendor (Pollution Systems, Inc.) said a 101,000 cfm system would be infeasible and instead recommended a zeolite concentrator with a smaller oxidizer. A zeolite concentrator can be used to achieve higher inlet POC loading to an RTO, while reducing the overall exhaust flowrate required to be oxidized. This has the effect of minimizing the design size of the RTO, which reduces the auxiliary fuel requirement.

Bayer was able to obtain a quote for this type of system from Pollution Systems, which is the equipment cost value used in the BACT cost analysis for both systems. The proposed systems

include a zeolite concentrator along with an oxidizer sized at 5,000 cfm or 10,000 cfm. The smaller 5,000 cfm system was conservatively used in the cost calculations since it is assumed that the 10,000 cfm system would cost more to purchase, operate, and maintain than the 5,000 cfm system.

Two design options were proposed: one using natural gas as an auxiliary fuel, and another electric system. The quoted capital cost of each system is the same, so the only difference would be the heat source. The attached *Appendix A – BACT Cost Analysis* for S-61 shows the cost effectiveness calculation for the RTO and Zeolite system.

As shown in the calculations, the proposed cost from the vendor for the RTO and Zeolite system is $1,200,000. The cost effectiveness of the RTO with Zeolite system for S-61 with a concentrator to remove 4.016 ton/year of POC emissions would cost $180,580 per ton of pollutant reduction. The cost effectiveness of the system exceeds the $17,500 BACT workbook cost effectiveness threshold for POC emissions. Therefore, an RTO system with a concentrator for S-61 is considered not cost effective.

Assuming the RTO and Zeolite system cost for Building 81 in S-13 is the same as S-61, even though staff anticipated the cost would be higher for higher flow rates. The cost effectiveness of the RTO system with a concentrator for Building 81, in S-13, to remove 8.799 ton/year of POC emissions would cost $82,419 per ton of pollutant removed. The calculated cost effectiveness exceeds the $17,500 BACT workbook cost effectiveness threshold for POC emissions. Therefore, the RTO system with a concentrator for S-13 is considered not cost effective. See Appendix B.

Because BACT 1 was deemed to be not cost effective, controls will need to meet BACT 2 achieved-in-practice. Bayer will comply with BACT 2 requirements which include minimizing use of solvents, use of lowest practical vapor pressure solvents, use of controlled flow solvent dispensers (squeeze bottles), and all clothes/papers and solvents not in active use will be kept in closed containers. Bayer will take steps to minimize the use of solvents as much as possible while adhering to FDA-approved procedures for cleaning and sterilization required for pharmaceutical production. Bayer will comply with use of lowest practical vapor pressure solvents. Bayer will comply with the use of controlled flow solvent dispensers by using hand-held squeeze bottles or impregnated wipes. Bayer will store materials not in active use in closed containers at all times.

By complying with the requirements of BACT 2, Bayer is expected to meet BACT compliance requirements.

Cumulative Increase

The following table provides a summary of the cumulative increase pursuant to Regulation 2-2-208. The table below reflects the current cumulative increase from the modification of S-13 and addition of S-60, S-61, and S-62.

Table 8. Cumulative Increase Review for Plant #12071

Pollutant	Existing Cumulative Increase (ton/year)	Emissions Decrease from S-13 (ton/year)	Emissions Increase from S-60 (ton/year)	Emissions Increase from S-61 (ton/year)	Emissions Increase from S-62 (ton/year)	New Cumulative Increase (ton/year)
POC	29.608	-8.989	1.687	4.016	1.687	28.010
NO_X	2.765	0.000	0.000	0.000	0.000	2.765
PM_{10}	0.790	0.000	0.000	0.000	0.000	0.790
$PM_{2.5}$	0.024	0.000	0.000	0.000	0.000	0.024
SO_2	0.051	0.000	0.000	0.000	0.000	0.051
CO	12.859	0.000	0.000	0.000	0.000	12.859

Offsets

Pursuant to Regulation 2-2-302, offsets must be provided for any un-offset cumulative increase at a facility that emits, or is permitted to emit, more than 10 tons per year of POC or NOx. Furthermore, pursuant to Regulation 2-2-303 offsets must be provided for any new or modified source at a major facility with a cumulative increase that exceeds 1.0 ton per year of particulate matter (PM_{10} and/or $PM_{2.5}$), or sulfur dioxide (SO_2). For purposes of Regulation 2-2-303, a major facility is defined as a facility that is permitted to emit 100 tons per year or more of PM_{10}, $PM_{2.5}$, or SO_2.

The following table provides a summary of the facility's PTE.

Table 6. Potential to Emit Review for Plant #12071						
Pollutant	Existing Potential to Emit (ton/year)	Emissions Decrease from S-13 (ton/year)	Emissions Increase from S-60 (ton/year)	Emissions Increase from S-61 (ton/year)	Emissions Increase from S-62 (ton/year)	New Potential to Emit (ton/year)
POC	29.608	-8.989	1.687	4.016	1.687	28.010
NO_X	7.319	0.000	0.000	0.000	0.000	7.319
PM_{10}	0.884	0.000	0.000	0.000	0.000	0.884
$PM_{2.5}$	0.086	0.000	0.000	0.000	0.000	0.086
SO_2	0.112	0.000	0.000	0.000	0.000	0.112
CO	14.062	0.000	0.000	0.000	0.000	14.062

As shown in Table 6, the facility has a PTE greater than 10 tons per year of POC, but less than 35 tons per year. Therefore, the facility is subject to the offset requirements of Regulation 2-2-302.1. The POC emission increases are smaller than the decreases in this application; therefore, offsets are not required.

California Environmental Quality Act (CEQA)

Bayer is constructing three new buildings that will contain wipe cleaning operations at their campus at 800 Dwight Way in Berkeley, California.

This permit application is categorically exempt from CEQA because the project has no potential for causing a significant adverse environmental impact, or the application is categorically exempt

from CEQA under CEQA Guidelines Section 15301 for Class 1: Existing facilities (also known as "No or Negligible Expansion of Existing Use" or "Minor Alterations to Existing Facilities". The addition of three new sources and reduction of overall existing emissions is a negligible expansion of existing use; Bayer is not increasing the size of their campus.

In making the determination that this application is categorically exempt: 1) the Air District reviewed the CEQA-related Information from the applicant (Regulation 2-1-426-1) indicating that there is no potential for a significant adverse environmental impact from the project; 2) a formal health risk assessment was approved by the Air District; and 3) the Air District determined there are no unusual circumstances, or that the cumulative impacts from successive projects of the same type in the same place do not result in significant adverse environmental impacts.

Form Appendix H was submitted by the applicant and reviewed by Air District Staff. Staff have determined this project has no potential for a significant adverse environmental impact.

Statement of Compliance

S-13, S-60, S-61, and S-62 are subject to and expected to be in compliance with the following:

Regulation 8, Rule 1: Organic Compounds, General Provisions

Wipe cleaning operations are subject to the storage and disposal requirements of Section 320, 321, and 322 of Regulation 8, Rule 1.

Regulation 8-1-320: Surface Preparation; Clean-up; Coating, Ink, Paint Removal
A person shall not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds that are used for surface preparation, clean-up, or coating, ink, or paint removal.

Used cloths/wipes from the wipe cleaning operation will be disposed of in closed-top containers. S-13, S-60, S-61, and S-62 are expected to comply with this regulation.

Regulation 8-1-321: Closed Containers
A person shall not store spent or fresh organic compounds to be used for surface preparation, clean-up, or coating, ink, or paint removal, in open containers.

S-13, S-60, S-61, and S-62 will comply with this section because the solvents used at S-13, S-60, S-61, and S-62 will be stored in closed containers.

Regulation 8-1-322: Spray Equipment Clean-up Limitation
A person shall not use organic compounds for the clean-up of spray equipment unless equipment is for collection of the cleaning compounds and minimizing its evaporation to the atmosphere.

S-13, S-60, S-61, and S-62 are not subject to Section 322 because the wipe cleaning operation will not be used for clean-up of spray equipment. However, fresh and spent organic compounds will be stored in closed containers to reduce solvent evaporation.

Regulation 8, Rule 4: Organic Compounds, General Solvent & Surface Coating Operations

S-13, S-60, S-61, and S-62 will be used for cleaning and decontamination of working surfaces rather than surface preparation of any products prior to coating, further treatment, sale, or intended use.

Regulation 8-4-113 – Exemption, Specified Operations exempts S-13, S-60, S-61, and S-62 from the requirements of Regulation 8, Rule 4. Based on Regulation 8-4-113, Regulation 8, Rule 4 does not apply to operations that are subject to the requirements of other Rules of this Regulation 8, or which comply with appropriate limitations of those Rules before their effective dates. S-13, S-60, S-61, and S-62 wipe cleaning operations take place in a pharmaceutical manufacturing setting. Therefore, S-13, S-60, S-61, and S-62 are subject to Regulation 8, Rule 24: Pharmaceutical and Cosmetic Manufacturing Operations.

Regulation 8-4-501: Recordkeeping Requirements

S-13, S-60, S-61, and S-62 will be conditioned to comply with the recordkeeping requirements applicable to wipe cleaning operations set forth in Section 501 of Regulation 8, Rule 4.

Regulation 8, Rule 16: Organic Compounds, Solvent Cleaning Operations

Regulation 8-16-111: Wipe Cleaning Exemption

Pursuant to the wipe cleaning exemption of Regulation 8-16-111, the requirements of Section 8-16-301 through 304 shall not apply to any solvent cleaning operation using only wipe cleaning. However, in addition to any VOC limitations in other Regulation 8 rules, wipe cleaning is subject to the recordkeeping requirements of Section 8-16-501.3.

Regulation 8-16-501: Recordkeeping Requirements

S-60, S-61, and S-62 use wipe cleaning only and are therefore not subject to the requirements of Sections 8-16-301 through 304. S-13, S-60, S-61, and S-62 will be subject to the monthly recordkeeping requirements of 8-16-501.3 which have been incorporated in the permit conditions.

Regulation 8, Rule 24: Pharmaceutical and Cosmetic Manufacturing Operations

Regulation 8-24-204 defines a pharmaceutical manufacturing plant as any plant producing or blending chemicals for use in pharmaceutical products and/or employing chemical processes in the manufacture of pharmaceutical products or medical devices. Bayer meets the definition of a pharmaceutical manufacturing plant because Bayer produces FDA grade medication at their facility.

Regulation 8-24-309: Surface Preparation and Cleanup Solvent
Bayer will be subject to the requirements of Regulation 8-24-309 – *Surface Preparation and Cleanup Solvent* which applies to any person using organic solvent for surface preparation and cleanup. 8-24-309.1 will require Bayer to use closed containers for the storage or disposal of

cloth or paper used for solvent surface preparation and cleanup. 8-24-309.2 will require Bayer to store fresh or spent solvent in closed containers.

The proposed permit conditions will ensure Bayer will comply with the Surface Preparation and Cleanup Solvent standards of Regulation 8-24-309.

New Source Performance Standards
There are no New Source Performance Standards (NSPS) that apply to this operation.

National Emission Standards for Hazardous Air Pollutants
There are no National Emission Standards for Hazardous Air Pollutants (NESHAP) that apply to this operation.

Public Notification (Regulation 2-1-412)
Pursuant to California Health & Safety Code §42301.6(a), prior to approving an application for a permit to construct or modification of a source, which is located within 1,000 feet from the outer boundary of a school site, the Air District shall prepare a public notice as detailed in §42301.6. §42301.9(a) defines a "school" as any public or private school used for the purposes of the education of more than 12 children in kindergarten or any grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes. Additionally, a public notice is required for an application for a new or modified source located within an Overburdened Community (OBC) as defined in Regulation 2-1-243, only if a Health Risk Assessment (HRA) is required pursuant to Regulation 2-5-401.

S-62 is located within 1,000 feet of Ecole Bilingue De Berkely Middle School and is therefore subject to a school public notice. S-13, S-60, S-61, and S-62 are located in an OBC, and an HRA was required, so public notice is required.

PERMIT CONDITIONS

The following changes will be made to Permit Condition #16577 for S-13. **Permit Condition #16577 will be updated to #100677.**

Plant 12071; S-13, Wipe Cleaning Operation

Amended Permit Condition #16577 in Permit Application #32196, June 2025

1. The owner/operator of S-13 shall ensure that the total POC emissions from ~~the~~ S-13 do not exceed ~~27.1~~ 18.106 tons in any consecutive rolling 12 month period.
   [Basis: Cumulative Increase, Regulation 2, Rule 5]

2. The owner/operator of S-13 shall use 70% by weight of isopropyl alcohol or solutions of isopropyl alcohol only at Buildings ~~5A,~~ 28A, ~~49, 49A, 50,~~ 53, ~~55,~~ 57/57A, 59, 60, 66, 80, and 81. The owner/operator of S-13 shall submit a new permit application ~~apply to BAAQMD for a change of conditions including a health risk screening analysis~~ to use isopropyl alcohol or solutions of isopropyl alcohol at ~~another~~ any new buildings in Site B2071. Hourly emissions, associated with the net usage of isopropyl alcohol, are limited

at the above buildings to not exceed the following emission rates, hourly, daily, and annual consecutive rolling 12 month period throughput limits:

~~a. Building 5A: 1.52 lb/hr (corresponds to net IPA usage of 39 fl. oz.)~~

a. Building 28A: ~~1.71~~ 1.5 lb/hr (~~,~~ 0.33 gallons per hour), and/or 7.9 gallons per calendar~~/~~ day,~ and/or 21 gallons in any consecutive rolling 12 month period)

~~b. Building 49: 2.53 lb/hr (corresponds to net IPA usage of 65 fl. oz.)~~

~~c. Building 49A: 1.51 lb/hr (corresponds to net IPA usage of 39 fl. oz.)~~

~~d. Building 50: 2.60 lb/hr (corresponds to net IPA usage of 67 fl. oz.)~~

b. Building 53: ~~4.32~~ 1.0 lb/hr~~,~~ (0.22 gallons per hour), and/or 5.2 gallons per calendar~~/~~ day,~ and/or 32 gallons in any consecutive rolling 12 month period.

~~e. Building 55: 5.59 lb/hr (corresponds to net IPA usage of 144 fl. oz.)~~

c. Building 57/57A: 1.30 lb/hr~~,net~~ (0.28 gallons per hour), and/or 6.8 gallons per calendar~~/~~ day, and/or 53 gallons in any consecutive rolling 12 month period.

d. Building 59: ~~0.008~~ 0.8 lb/hr~~.~~ (0.174 gallons per hour), and/or 4.2 gallons per calendar~~/~~ day,~ and/or 158 gallons in any consecutive rolling 12 month period.

e. Building 60: 8.17 lb/hr (~~,~~ 1.78 gallons per hour), and/or 42.8 gallons per calendar~~/~~ day,~ and/or 2,953 gallons in any consecutive rolling 12 month period.

f. Building 66: ~~5.27~~ 4.6 lb/hr~~,~~ (1.09 gallons per hour), and/or 26.2 gallons per calendar ~~/~~day,~ and/or 738 gallons in any consecutive rolling 12 month period.

g. Building 80: 0.86 lb/hr (~~,~~ 0.19 gallons per hour), and/or 4.5 gallons per calendar~~/~~ day, and/or 105 gallons in any consecutive rolling 12 month period.

h. Building 81: 32.73 lb/hr~~,~~ (7.14 gallons per hour), and/or 171.3 gallons per calendar~~/~~ day, and/or 3,838 gallons in any consecutive rolling 12 month period.

[Basis: Regulation 2-5-302.3~~, Rule 5~~]

3. Materials other than those specified in part 2 may be used at S-13, provided that the owner/operator of S-13 can demonstrate that all of the following requirements are satisfied:

   a. Total precursor organic compound (POC) emissions from S-13 do not exceed 1,233 pounds during any calendar day and/or ~~27.1~~ 18.106 tons in any consecutive, rolling 12 month period.
   b. No non-precursors organic compounds (NPOC) as defined by BAAQMD Regulation 1-234 are used.
   c. No toxic air contaminant other than isopropyl alcohol is used.

   [Basis: Cumulative Increase, Regulation 2, Rule 5]

4. The owner/operator of S-13 shall comply with the surface preparation and cleanup solvent provisions in BAAQMD Regulation 8-24-309. The owner/operator of S-13 shall implement best management practices by performing the following:
   a. Minimize use of solvents;
   b. Use controlled flow solvent dispensers (e.g. squeeze bottles or wipes);
   c. Not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds; and,
   d. Not store spent or fresh organic compounds in open containers

   [Basis: 8-24-309, BACT]

5. To determine compliance with the above conditions, the Owner/Operator of S-13 shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions, including the following information:

    a. Quantities and product type of IPA (ex. jug, squeeze bottles, impregnated wipes, etc.) used at each building on an ~~daily~~hourly- basis.
    b. Hourly usage shall be totaled for each calendar day.
    ~~a.~~c. ~~Hourly usage~~ Daily usage shall be totaled for each month.
    d. Monthly usage and/or emissions shall be totaled for each consecutive twelve-month period.

    All records shall be retained on-site for two years from the date of entry, and made available for inspection by Air District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable Air District Regulations.
    [Basis: Recordkeeping, Regulation 2-5-302.3]

~~5. The owner/operator of S-13 shall maintain dated facility wide records in an Air District approved log of the type and amount of solvent used in each hour at each building that constitutes S-13. The owner/operator shall combine the hourly solvent usage and associated emissions records on a daily, monthly, and rolling consecutive 12 month basis. These records shall be retained for a period of at least 2 years from date of entry. The logs shall be kept on site and made available to Air District staff for inspection upon request.~~
~~[Basis: Cumulative Increase]~~

S-60 will be subject to Permit Condition #100420.

1. The owner/operator of S-60 shall not exceed the following usage limits:

    S-60, Building 68:

Isopropanol (70% by weight)	2.02 gal/calendar day
Isopropanol (70% by weight)	736 gal during any consecutive twelve-month period

    [Basis: Cumulative Increase, Toxics]

2. The owner/operator of S-60 shall ensure that total POC emissions do not exceed 9.2 pounds during any calendar day and/or 3,374 pounds during any consecutive twelve-month period.
    [Basis: Cumulative Increase]

3. The owner/operator of S-60 shall implement best management practices by performing the following:
    a. Minimize use of solvents;

b. Use controlled flow solvent dispensers (e.g. squeeze bottles or wipes);
c. Not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds; and,
d. Not store spent or fresh organic compounds in open containers.

[Basis: Regulation 8-24-309]

4. To determine compliance with the above parts, the owner/operator of S-60 shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:

   a. Quantities and product type of IPA (ex. jug, squeeze bottles, impregnated wipes, etc.) used at S-60 on a daily basis.
   b. Daily usage shall be totaled for each month.
   c. Monthly usage shall be totaled for each consecutive twelve-month period.

   All records shall be retained on-site for two years, from the date of entry, and shall be made available for inspection by Air District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable Air District Regulations.

   [Basis: Recordkeeping, Cumulative Increase, Regulation 2, Rule 5]

S-61 will be subject to Permit Condition #100421.

1. The owner/operator of S-61 shall not exceed the following usage limits:

S-61, Building 69:	
Isopropanol (70% by weight)	4.80 gal/calendar day
Isopropanol (70% by weight)	1,752 gal during any consecutive twelve-month period

   [Basis: Cumulative Increase, BACT, Toxics]

2. The owner/operator of S-61 shall ensure that total POC emissions do not exceed 22.0 pounds during any calendar day and/or 8,033 pounds during any consecutive twelve-month period.
   [Basis: Cumulative Increase, BACT]

3. The owner/operator of S-61 shall implement best management practices by performing the following:
   a. Minimize use of solvents;
   b. Use controlled flow solvent dispensers (e.g. squeeze bottles or wipes);
   c. Not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds; and,
   d. Not store spent or fresh organic compounds in open containers.

   [Basis: Regulation 8-24-309, BACT]

4. To determine compliance with the above parts, the owner/operator of S-61 shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:

    a. Quantities and product type of IPA (ex. jug, squeeze bottles, impregnated wipes, etc.) used at S-61 on a daily basis.
    b. Daily usage shall be totaled for each month.
    c. Monthly usage shall be totaled for each consecutive twelve-month period.

    All records shall be retained on-site for two years, from the date of entry, and shall be made available for inspection by Air District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable Air District Regulations.

    [Basis: Recordkeeping, Cumulative Increase, Regulation 2, Rule 5]

S-62 will be subject to Permit Condition #100422.

1. The owner/operator of S-62 shall not exceed the following usage limits:

S-62, Building 88:	
Isopropanol (70% by weight)	2.02 gal/calendar day
Isopropanol (70% by weight)	736 gal during any consecutive twelve-month period

[Basis: Cumulative Increase, Toxics]

2. The owner/operator of S-62 shall ensure that total POC emissions do not exceed 9.2 pounds during any calendar day and/or 3,374 pounds during any consecutive twelve-month period.
[Basis: Cumulative Increase]

3. The owner/operator of S-62 shall implement best management practices by performing the following:
    a. Minimize use of solvents;
    b. Use controlled flow solvent dispensers (e.g. squeeze bottles or wipes);
    c. Not use open containers for the storage or disposal of cloth or paper impregnated with organic compounds; and,
    d. Not store spent or fresh organic compounds in open containers.

    [Basis: Regulation 8-24-309]

4. To determine compliance with the above parts, the owner/operator of S-62 shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:

a. Quantities and product type of IPA (ex. jug, squeeze bottles, impregnated wipes, etc.) used at S-62 on a daily basis.
b. Daily usage shall be totaled for each month.
c. Monthly usage shall be totaled for each consecutive twelve-month period.

All records shall be retained on-site for two years, from the date of entry, and shall be made available for inspection by Air District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable Air District Regulations.

[Basis: Recordkeeping, Cumulative Increase, Regulation 2, Rule 5]

End of Conditions

Recommendation

The Air District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of the Air District, state, and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct/Permit to Operate for the equipment listed below. However, the proposed source is within 1000' of Ecole Bilingue De Berkely Middle School, located in an Overburdened Community, and required an HRA, which triggers the public notification requirements of Air District Regulation 2-1-412. After the comments are received and reviewed, the Air District will make a final determination on the permit.

I recommend that the Air District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct for the following sources:

S-60 Wipe Cleaning Operation, Building 68
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 2.02 gal/day
Maximum Annual Throughput: 736 gal/year

S-61 Wipe Cleaning Operation, Building 69
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 4.80 gal/day
Maximum Annual Throughput: 1,752 gal/year

S-62 Wipe Cleaning Operation, Building 88
70% Isopropyl Alcohol-30%Water Solvent Mixture
Maximum Daily Throughput: 2.02 gal/day
Maximum Annual Throughput: 736 gal/year

And Permit to Operate for:

S-13 Facility Wide Wipe Cleaning Operation
70% Isopropyl Alcohol-30%Water Solvent Mixture
Building 28A Maximum Throughput: 7.9 gal/day, 21 gal/year
Building 53 Maximum Throughput: 5.2 gal/day, 32 gal/year
Building 57/57A Maximum Throughput: 6.8 gal/day, 53 gal/year
Building 59 Maximum Throughput: 4.2 gal/day, 158 gal/year
Building 60 Maximum Throughput: 42.8 gal/day, 2,953 gal/year
Building 66 Maximum Throughput: 26.2 gal/day, 738 gal/year
Building 80 Maximum Throughput: 4.5 gal/day, 105 gal/year
Building 81 Maximum Throughput: 171.3 gal/day, 3,838 gal/year

By: Bao Trinh, Senior Air Quality Engineer Date: 07/09/2025

Appendix A – S-61 BACT Cost Analysis

Cost-Effectiveness Analysis for Electric Thermal Oxidizer with Concentrator

Notes:
1) Used equipment cost from cost-effectiveness analysis from Pollution Systems dated 06/14/24
2) This analysis includes POC emissions for total VOC
3) Operating hours are 24 hours/day, 7 days/week, 52 weeks/year
4) Other references are noted in right column

CAPTIAL INVESTMENT

Direct Costs			
Category	**Factor**	**Cost (TO)**	**Reference/Notes**
Equipment Cost (EC)		$1,200,000	Quote from Pollution Systems for Bayer dated 06/14/24
Sales Tax	3%	$36,000	3% of EC, Table 2.10 EPA Doc
Freight	5%	$60,000	5% of EC, Table 2.10 EPA Doc
Instrumentation	10%	$120,000.0	10% of EC, Table 2.10 EPA Doc
PURCHASED EQUIP COST (PEC)		**$1,416,000**	sum above, Table 2.10 EPA doc
Direct Installation Costs			
Foundations/Supports	8%	$113,280	8% of PEC, Table 2.10 EPA doc
Handling/Erection	14%	$198,240	14% of PEC, Table 2.10 EPA doc
Electrical	4%	$56,640	4% of PEC, Table 2.10 EPA doc
Piping	2%	$28,320	2% of PEC, Table 2.10 EPA doc
Ductwork	1%	$14,160	1% of PEC, Table 2.10 EPA doc
Painting	1%	$14,160	1% of PEC, Table 2.10 EPA doc
DIRECT INSTALLATION COSTS (DIC)		**$424,800**	sum above
TOTAL DIRECT COSTS (DC)		**$1,840,800**	PEC + DIC, Table 2.10 EPA doc
Indirect Costs			
Engineering	10%	$141,600	10% of PEC, Table 2.10 EPA doc
Construction/Field Expenses	5%	$70,800	5% of PEC, Table 2.10 EPA doc
Contractor Fees	10%	$141,600	10% of PEC, Table 2.10 EPA doc
Start-Up	2%	$28,320	2% of PEC, Table 2.10 EPA doc
Performance Test	1%	$14,160	1% of PEC, Table 2.10 EPA doc
TOTAL INDIRECT COSTS (IC)		**$396,480**	sum above, Table 2.10 EPA doc
Contingencies (C)	10%	$223,728.00	10% of (DC+IC), Table 2.10 EPA doc
TOTAL CAPITAL INVESTMENT (TCI)		**$2,461,008.00**	DC+IC+C, Table 2.10 EPA doc

ANNUAL COSTS

Operating Days	365	days/yr		Bayer operating schedule
Category	**Factor**	**Unit**	**Cost (TO)**	**Reference/Notes**
Direct Annual Costs (DAC)				
Operating Labor				
Operator Labor	$17.00	hr	$ 3,103	0.5 hr/shift/day @ $17.00/hr (Alameda County 2024 min wage)
Supervisor	15%		$ 465.38	15% of labor costs, Table 2.12 EPA Doc
Operating Materials				
Maintenance Labor	$17.00	hr	$ 442	0.5 hr/shift/day @ $17.00/hr (Alameda County 2024 min wage)
Materials	100%		$ 442	100% of maintenance labor, Table 2.12 EPA Doc
Utilities				
Natural Gas	$0.00	/Mcf	$0.00	Electric only system
Electricity Unit Cost	$0.28743	kwh		E-20 Industrial Electricity Cost 2024
				132 kwh*(24 hr/day)*(365 days/yr)*($0.28743/kwh), Bayer operating schedule and
Annual Electricity Cost			$332,361.06	$0.28743/kwh from Energy Sage 2024 estimate, power based on a 600 FLA system
TOTAL DIRECT ANNUAL COST (DAC)			**$ 336,813**	sum above, Table 2.12 EPA Doc
Indirect Annual Costs				
Overhead	60%		$ 2,671.13	Factor*(operating labor + Operating Materials), Table 2.12 EPA Doc
Administrative	2%		$49,220.16	Factor*TCI, Table 2.12 EPA Doc
Property Taxes	1%		$24,610.08	Factor*TCI, Table 2.12 EPA Doc
Insurance	1%		$24,610.08	Factor*TCI, Table 2.12 EPA Doc
Equipment Life	20	yrs		Table 2.12, EPA doc
				BACT Handbook estimation method based on 10-20 year and November 2022 treasury
Interest Rate	6%			note interest rate data
Capital Recovery Factor (CRF)	10.20%			Guidance from Nicholas Maiden
Capital Recovery			$251,022.82	CRF*TCI, Table 2.12 EPA Doc
TOTAL INDIRECT ANNUAL COST (IAC)			**$ 352,134**	sum above, Table 2.12 EPA Doc
TOTAL ANNUALIZED COST (TAC)			**$ 688,947**	DAC+IAC, Table 2.12 EPA Doc

COST-EFFECTIVENESS

Total Annual VOC Emissions	4.016	TPY		
VOC Capture Efficiency	95.0%			Abatement efficiency achieved in practice
Annual VOC Removed	3.815	TPY		
Total Annual Cost (TAC)			$ 688,947	
Cost- Effectiveness ($/TPY)			**$ 180,580**	

Cost effectiveness threshold per BACT policy & implementation procedure	$17,500	per TPY; based on BACT workbook for POC emissions

Appendix B – S-13 BACT Cost Analysis

Cost-Effectiveness Analysis for Electric Thermal Oxidizer with Concentrator

Notes:
1) Used equipment cost from cost-effectiveness analysis from Pollution Systems dated 06/14/24
2) This analysis includes POC emissions for total VOC
3) Operating hours are 24 hours/day, 7 days/week, 52 weeks/year
4) Other references are noted in right column

CAPTIAL INVESTMENT

Direct Costs				
Category	**Factor**	**Cost (TO)**		**Reference/Notes**
Equipment Cost (EC)		$1,200,000		Quote from Pollution Systems for Bayer dated 06/14/24
Sales Tax	3%	$36,000		3% of EC, Table 2.10 EPA Doc
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Instrumentation	10%	$120,000.0		10% of EC, Table 2.10 EPA Doc
PURCHASED EQUIP COST (PEC)		**$1,416,000**		sum above, Table 2.10 EPA doc
Direct Installation Costs				
Foundations/Supports	8%	$113,280		8% of PEC, Table 2.10 EPA doc
Handling/Erection	14%	$198,240		14% of PEC, Table 2.10 EPA doc
Electrical	4%	$56,640		4% of PEC, Table 2.10 EPA doc
Piping	2%	$28,320		2% of PEC, Table 2.10 EPA doc
Ductwork	1%	$14,160		1% of PEC, Table 2.10 EPA doc
Painting	1%	$14,160		1% of PEC, Table 2.10 EPA doc
DIRECT INSTALLATION COSTS (DIC)		**$424,800**		sum above
TOTAL DIRECT COSTS (DC)		**$1,840,800**		PEC + DIC, Table 2.10 EPA doc
Indirect Costs				
Engineering	10%	$141,600		10% of PEC, Table 2.10 EPA doc
Construction/Field Expenses	5%	$70,800		5% of PEC, Table 2.10 EPA doc
Contractor Fees	10%	$141,600		10% of PEC, Table 2.10 EPA doc
Start-Up	2%	$28,320		2% of PEC, Table 2.10 EPA doc
Performance Test	1%	$14,160		1% of PEC, Table 2.10 EPA doc
TOTAL INDIRECT COSTS (IC)		**$396,480**		sum above, Table 2.10 EPA doc
Contingencies (C)	10%	$223,728.00		10% of (DC+IC), Table 2.10 EPA doc
TOTAL CAPITAL INVESTMENT (TCI)		**$2,461,008.00**		DC+IC+C, Table 2.10 EPA doc

ANNUAL COSTS

Operating Days		365 days/yr			Bayer operating schedule
Category	**Factor**	**Unit**	**Cost (TO)**		**Reference/Notes**
Direct Annual Costs (DAC)					
Operating Labor					
Operator Labor	$17.00	hr	$	3,103	0.5 hr/shift/day @ $17.00/hr (Alameda County 2024 min wage)
Supervisor	15%		$	465.38	15% of labor costs, Table 2.12 EPA Doc
Operating Materials					
Maintenance Labor	$17.00	hr	$	442	0.5 hr/shift/day @ $17.00/hr (Alameda County 2024 min wage)
Materials	100%		$	442	100% of maintenance labor, Table 2.12 EPA Doc
Utilities					
Natural Gas	$0.00	/Mcf		$0.00	Electric only system
Electricity Unit Cost	$0.28743	kwh			E-20 Industrial Electricity Cost 2024
					132 kwh*(24 hr/day)*(365 days/yr)*($0.28743/kwh), Bayer operating schedule and
Annual Electricity Cost				$332,361.06	$0.28743/kwh from Energy Sage 2024 estimate, power based on a 600 FLA system
TOTAL DIRECT ANNUAL COST (DAC)			**$**	**336,813**	sum above, Table 2.12 EPA Doc
Indirect Annual Costs					
Overhead	60%		$	2,671.13	Factor*(operating labor + Operating Materials), Table 2.12 EPA Doc
Administrative	2%			$49,220.16	Factor*TCI, Table 2.12 EPA Doc
Property Taxes	1%			$24,610.08	Factor*TCI, Table 2.12 EPA Doc
Insurance	1%			$24,610.08	Factor*TCI, Table 2.12 EPA Doc
Equipment Life	20	yrs			Table 2.12, EPA doc
					BACT Handbook estimation method based on 10-20 year and November 2022 treasury
Interest Rate	6%				note interest rate data
Capital Recovery Factor (CRF)	10.20%				Guidance from Nicholas Maiden
Capital Recovery				$251,022.82	CRF*TCI, Table 2.12 EPA Doc
TOTAL INDIRECT ANNUAL COST (IAC)			**$**	**352,134**	sum above, Table 2.12 EPA Doc
TOTAL ANNUALIZED COST (TAC)			**$**	**688,947**	DAC+IAC, Table 2.12 EPA Doc

COST-EFFECTIVENESS

Total Annual VOC Emissions	8.799	TPY			Using Building 81 (highest daily emissions)
VOC Capture Efficiency	95.0%				Abatement efficiency achieved in practice
Annual VOC Removed	8.359	TPY			
Total Annual Cost (TAC)			$	688,947	
Cost- Effectiveness ($/TPY)			**$**	**82,419**	

Cost effectiveness threshold per BACT policy & implementation procedure	$17,500	per TPY; based on BACT workbook for POC emissions

Appendix C – S-13 Pre-Project and Post-Project Changes

Pre-Project Previously Permitted in Application #27619												
Source #	**Building #**	**Current Hourly Emission Limit (lb/hour)**	**fl oz. (permit conditon 16577 part 2)**	**Max Hourly Throughput (gal/hour)**	**Max Daily Throughput (gal/day)**	**Max Annual Throughput (gal/year)**	**Solvent Density (lb/gal)**	**% w/w**	**Hourly Emission Rate (lb/hour)**	**Daily Emission Rate (lb/day)**	**Annual Emission Rate (lb/year)**	**Annual Emission Rate (ton/year)**
S-13	5A	1.52	39	0.30	7.3	10888	7.11	70%	1.52	36.4	54189.58	27.095
	28A	1.71	44	0.34	8.3				1.71	41.1		
	49	2.53	65	0.51	12.2				2.53	60.7		
	49A	1.51	39	0.30	7.3				1.52	36.4		
	50	2.6	67	0.52	12.6				2.61	62.5		
	53	4.32	111	0.87	20.8				4.32	103.6		
	55	5.59	144	1.13	27.0				5.60	134.4		
	57/57A	1.3	33	0.26	6.2				1.28	30.8		
	59	0.008	0.2	0.00	0.0				0.01	0.2		
	60	8.17	210	1.64	39.4				8.17	196.0		
	66	5.27	135	1.05	25.3				5.25	126.0		
	80	0.86	22	0.17	4.1				0.86	20.5		
	81	32.73	842	6.58	157.9				32.74	785.7		
Total		**68.12**	**1,751.2**	**13.68**	**29.8**	**10,888**			**68.1**	**148.5**	**54,189.6**	**27.095**

Notes:

1) Per Bayer on 4/16/25 as an option to pass HRA with an acute HI of 1.0, Bayer wants to reduce hourly emission limit for B53 from 4.32 lb/hr to 1.0 lb/hr, decrease building 28A from 1.71 lb/hr to 1.5 lb/hr, decrease building 66 from 5.27 lb/hr to 5.0 lb/hr, and increase building 59 from 0.008 lb/hr to 0.8 lb/hr.

2) Annual throughputs remain the same per Bayer.

Post-Project With Reduction in Emissions												
Source #	**Building #**	**New Hourly Emission Limit (lb/hour)**	**fl oz. (permit conditon 16577 part 2)**	**Max Hourly Throughput (gal/hour)**	**Max Daily Throughput (gal/day)**	**Max Annual Throughput (gal/year)**	**Solvent Density**	**% w/w**	**Hourly Emission Rate (lb/hour)**	**Daily Emission Rate (lb/day)**	**Annual Emission Rate (lb/year)**	**Annual Emission Rate (ton/year)**
S-13	5A	0	0	0.00	0.0	0	6.55	70%	0.0	0.0	0	0.000
	28A	1.5	44	0.33	7.9	21			1.50	36.0	96	0.048
	49	0	0	0.00	0.0	0			0.0	0.0	0	0.000
	49A	0	0	0.00	0.0	0			0.0	0.0	0	0.000
	50	0	0	0.00	0.0	0			0.0	0.0	0	0.000
	53	1.0	111	0.22	5.2	32			1.00	24.0	147	0.073
	55	0	0	0.00	0.0	0			0.0	0.0	0	0.000
	57/57A	1.3	33	0.28	6.8	53			1.30	31.2	243	0.122
	59	0.8	0.2	0.174	4.2	158			0.800	19.2	724	0.362
	60	8.17	210	1.78	42.8	2953			8.17	196.1	13540	6.770
	66	5.0	135	1.09	26.2	738			5.00	120.0	3384	1.692
	80	0.86	22	0.19	4.5	105			0.86	20.6	481	0.241
	81	32.73	842	7.14	171.3	3838			32.73	785.5	17597	8.799
Total		**51.4**	**1,397.2**	**11.20**	**268.8**	**7,898**			**51.36**	**1,232.64**	**36,212.33**	**18.106**