Commonwealth of Pennsylvania
Department of Environmental Protection
Air Quality Bureau
May 31, 2018

Subject: Plan Approval Technical Review Memo
Richard E. Pierson Materials Corporation
East Rockhill Twp., Bucks County, PA
Plan Approval 23-0123
(APS ID: 969158, Auth ID: 1230811)

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I. Introduction

On May 23, 2018, Richard E. Pierson Materials Corporation (*R.E. Pierson*) submitted a new plan approval application and the processing fee in the amount of $1,700 for the construction of a new 1,000 ton per hour (tph) non-metallic mineral processing plant equipped with a wet suppression system at the Hanson Quarry located at 2205 North Rockhill Rd., in East Rockhill Twp., Bucks County.

The facility is located in an area that is designated as *Nonattainment* for the 2008 8-hour ozone standard (e.g., 0.075 ppm) and *Attainment* for the 2012 annual particulate matter ($PM_{2.5}$) standard (12 μg/m^3) and that is specially regulated in which the New Source Review trigger values for NOx and VOC increases are similar to that of a severe non-attainment area. NOx and VOC emissions in the presence of sunlight act as precursors for the formation of ozone.

A major source is defined as having the potential to emit (*PTE*) a regulated New Source Review (*NSR*) pollutant in amounts greater than the designated threshold for that area. For Bucks County, any facility with a PTE greater than 25.0 tons per year (*tpy*) for VOCs or NOx is considered a major source. The facility will be powered by electricity; therefore, there are no pollutant emissions except for particulate matter.

II. Source Analysis

A. Crushing Equipment

The construction of the proposed 1,000 tph non-metallic mineral processing plant will be completed as a two-phase project. Table 1 lists the proposed sources and equipment to be constructed during Phase I.

Table 1. Richard E. Pierson Material Corp. – Proposed 1,000 tph Non-metallic Mineral Processing Plant at Hanson Quarry (Phase I)

Unit	Manufacturer	Model No./Type
Primary (Jaw) Crusher	Metso	C140
C1 Conveyor		
C2 Conveyor		
3-Deck (scalping) Screen		7' x 16'
C3 Conveyor		
C5 Conveyor		
C6 Conveyor		
C4 Conveyor		
C7 Conveyor		
C8 Conveyor		

Table 2 lists the proposed sources and equipment to be constructed during Phase II.

Table 2. Richard E. Pierson Material Corp. – Proposed 1,000 tph Non-metallic Mineral Processing Plant at Hanson Quarry (Phase II)

Unit	Manufacturer	Model No./Type
C14 Conveyor		36" x 32'
C15 Conveyor		36" x 92'
C16 conveyor		36" x 70'
Secondary (Cone) Crusher	Metso	HP400
C13 Conveyor		48" x 256'
4-Deck Screens (2)		8' x 24'
C24 Conveyor		30" x 120'
C12A and C12B conveyors		42" x 180'
C26 Conveyor		30" x 50'
Tertiary (Cone) Crusher	Metso	HP400 (std. fine)
Quaternary (Cone) Crusher	Metso	HP400 (sh. medium)
4-Deck Sizing Screens (2)		8' x 24'
C25A and C25B Conveyors		48" x 30'
C13 Conveyor		48" x 256'
C11 Conveyor		48" x 100'
Cone Crusher	Metso	GP300S (extra course)
2-Deck Screen		5' x 14'
C10 Conveyor		48" x 140'
C14 Conveyor		36" x 32'
C15 Conveyor		36" x 92'
C16 conveyor		36" x 70'
C17 Conveyor		36" x 42'
C18 Conveyor		36" x 116'
C19 Conveyor		36" x 70'
C20 Conveyor		30" x 51'
C21 Conveyor		30" x 100'
C22 Conveyor		30" x 32'
C23 Conveyor		30" x 340'
C24 Conveyor		30" x 136'
C27 (Bypass) Conveyor		30" x 50'
C28 Radial Stacker Conveyor		30" x 100'
C29 Radial Stacker Conveyor		30" x 100'
C30 Radial Stacker Conveyor		30" x 100'
C31 Radial Stacker Conveyor		30" x 100'

The plant will have two (2) front-end loaders. Trucks will drive to the specific piles where the front-end loaders are used to load them. The plant will produce the following products with the storage pile sizes and capacities:

- Size #2A (minus 2"): 13,800 tons/Ballast (2" to 4"): 6,700 tons /Surge pile (4" to 6"): 30,000 tons
- Size #8 (3/16" to 1/2"): 13,800 tons
- Size #57 (1/4" to 1.5"): 13,800 tons
- Size 1/4" (minus 3/8" max.): 13,800 tons
- Size 310 (minus 3/16") screening: 10,000 tons

The plant will process diabase stone and is projected operate a maximum of 2,800 hours per year as a 12-month rolling sum. Note: Rocks that are considered to be mineral resources include two (2) carbonate rocks, limestone, which consists mostly of calcite, and dolomite, which consists mostly of the mineral dolomite; diabase, which consists mainly of interlocking laths of feldspar and pyroxene and sandstone, which commonly contains quartz and feldspar[1]. In accordance with 40 C.F.R. Part 60, Subpart OOO, diabase stone meets the definition of nonmetallic mineral. The primary portion of the plant (up to and including the surge pile) is projected to operate during daylight hours while the equipment following the surge pile could operate for more hours depending upon market demand.

B. Wet Dust Suppression System (PM Emission Control)

The fugitive particulate matter from the 1,000 tph non-metallic mineral processing plant will be controlled with a wet dust suppression system (WDSS). The WDSS will be custom built by the Mellott Company and will be used whenever the plant is processing stone by wetting the open drops from the conveyors to the surge piles.

The WDSS will be equipped with two (2) dust suppression tanks. Dust suppression tank 1 will be employed in two (2) zones during Phase I and the WDSS shall be equipped with forty-eight (48) nozzles and a gauge to monitor the water flow rate. During Phase I, the water flow rate for the WDSS shall be in the range of 1.0 to 41.53 gallons per minute.

Dust suppression tank 2 will be employed in two (2) zones during Phase II and the WDSS shall be equipped with one hundred thirty-six (136) nozzles and a gauge to monitor the water flow rate. During Phase II, the water flow rate for the WDSS shall be in the range of 1.0 to 113.09 gallons per minute.

The WDSS is expected to reduce the emissions of fugitive particulate matter to approximately less than 7.8 tons per year.

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[1] Barnes, J. H., and Smith, R. C., II, 2001, The Nonfuel Mineral Resources of Pennsylvania: Pennsylvania Geological Survey, 4th ser. Educational Series 12, 38 p.

III. Emissions Analysis

R.E. Pierson estimated the potential uncontrolled PM emissions based on the entire plant operating 2,800 hours per year and producing non-washed aggregates. The company used Metso-Bruno Process Simulation software to calculate the maximum product throughput from twenty-five (25) primary source types (e.g., crushers, screens, transfer points and drops) in continuous operation with specific feed material quality.

The company used the throughput data and the emissions factors for PM and PM10, in lb/ton, from AP-42, Table 11.19.2-2 for crushed stone processing operations to calculate the potential PM emissions from the crushers, screens and transfer points.

The potential emissions from the drops were calculated using Equation 1 from AP-42 Section 13.2.4.3 (*Predictive Emission Factors Equations*):

Equation 1 $$E = k(0.0032)\ \left(\frac{U}{5}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.5} \quad \text{(lb/ton)}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Worst-case emissions from storage piles occur under dry, windy conditions. The controlled emissions for drop calculations assume a 90% control efficiency for the wet dust suppression system.

The company estimates that the total fugitive PM and PM10 emissions from the plant to be **7.71 tpy** and **4.21 tpy**, respectively, and the plan approval limits the total particulate matter emissions (PM and/or PM10) from the facility not to exceed 7.8 tpy. The potential PM/PM10 emissions calculations are shown in the Appendix.

IV. Regulatory Analysis

A. 40 CFR 60, Subpart OOO – Standards of Performance for Non-Metallic Mineral Processing Plants

40 CFR 60, Subpart OOO promulgates the New Source Performance Standards (*NSPS*) for sources and equipment associate with nonmetallic mineral processing plants. The regulation establishes stack and fugitive opacity and particulate matter limits for facilities which have commenced construction and operation after the effective date August 31, 1983.

R.E. Pierson proposes to construct and utilize a wet dust suppression system (*WDSS*) to control the fugitive particulate matter emissions from its crushers, screens, conveyors and drops. The permittee must comply with the following opacity limits for facilities without capture systems from Table 3 of the subpart:

1. The owner or operator must meet the 7% opacity fugitive emissions limit for grinding mills, screening operations, bucket elevators, transfer points on belt conveyors, bagging operations, storage bins, enclosed truck or railcar loading stations or from any other affected sources defined in the subpart.

2. The owner or operator must meet the 12% opacity fugitive emissions limit for crushers at which a capture system is not used.

Pursuant to 40 CFR §60.674, the owner or operator of a facility that uses wet suppression to control emissions from the facility must perform periodic (e.g., monthly) inspections to assure that water is flowing to discharge spray nozzles in the wet suppression system.

Pursuant to 40 CFR §60.675, the owner or operator is required to demonstrate compliance with these opacity limits by conducting an initial Method 9 performance test in accordance with 40 CFR §60.11.

Pursuant to 40 CFR § §60.676, the owner or operator of any affected facility shall submit written reports of the results of all performance tests conducted to demonstrate compliance with the standards set forth in 40 CFR § 60.672, including reports of opacity observations made using Method 9 (40 CFR part 60, appendix A-4) to demonstrate compliance with 40 CFR §60.672(b).

V. Recommendation

I recommend issuance of Plan Approval No. 09-0241 for R.E. Pierson Materials Corporation for the installation of a 1,000 tph non-metallic mineral processing plant.

R.E. Pierson Materials Corp. Technical Review Memo Appendix

To estimate the potential fugitive particulate matter emissions from the construction and operation of the 1,000-tph non-metallic mineral processing plant at the Hanson Quarry, R.E. Pierson used the Bruno Process Simulation software to calculate the maximum product throughput from twenty-five (25) primary source types (e.g., crushers, screens, transfer points and drops) operating 2,800 hours per year.

The potential fugitive particulate matter emissions from the drops are calculated using the throughput date and the emission factor obtained using Equation 1 from AP-42 Section 13.2.4.3.

Equation 1 $E = k(0.0032)\ (\frac{U}{5})^{1.3}/(\frac{M}{2})^{1.5}$ (lb/ton)

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Table 3 contains the empirical values for the variables and the values for uncontrolled emission factor for PM and PM10 for drop.

Table 3. R.E. Pierson Material Corporation Drop Emission Factor Calculation

Pollutant	Moisture Content (%)	k	U (mph)
PM	5	0.74	6.90
PM10	5	0.35	6.90

Using the data in Table 3, the PM/PM10 emission factors for drops are calculated as follows:

- PM Emission Factor: $E = k(0.0032)\ (\frac{U}{5})^{1.3}/(\frac{M}{2})^{1.5}$

  $= (0.74)\ (0.0032)\ ((6.9/5)^{1.3} \div (5/2)^{1.5})$

  $= (0.74)\ (0.0032)\ (1.51999 \div 3.9528)$

  $= (0.74)\ (0.0032)(0.3845) =$ **0.000910 lb/ton**

- PM10 Emission Factor: $E = k(0.0032)\ (\frac{U}{5})^{1.3}/(\frac{M}{2})^{1.5} = 0.35(0.0032)(0.3845)$

  = **0.00043 lb/ton**

R.E. Pierson proposed PM and PM10 emission factors of 0.000998 lb/ton and 0.000472 lb/ton, respectively, for particulate matter with average size diameters less than 30 microns.

Table 4 contains the potential fugitive PM and PM10 emission estimates.

Table 4. R.E. Pierson Material Corporation PM/PM10 Emissions Data

Emission Point	Source Type	Throughput (tph)[1]	PM E.F. (lb/ton)	PM10 E.F. (lb/ton)	PM PTE (tpy)	PM10 PTE (tpy)
1	Drop	1,006	0.000998	0.000472	0.141	0.066
2	Jaw Crusher	510	0.0012	0.00054	0.857	0.386
3	Transfer Point	496	0.00014	0.000046	0.097	0.032
4	Screen	1,006	0.0022	0.00074	3.098	1.042
5	Transfer Point	189	0.00014	0.000046	0.037	0.012
6	Drop	189	0.000998	0.000472	0.026	0.012
7	Transfer Point	102	0.00014	0.000046	0.020	0.007
8	Transfer Point	140	0.00014	0.000046	0.027	0.009
9	Drop	817	0.000998	0.000472	0.114	0.054
10	Screen	464	0.0022	0.00074	1.429	0.481
11	Crusher	405	0.0012	0.00054	0.566	0.306
12	Transfer Point	60	0.00014	0.000046	0.012	0.004
13	Screens	1,137	0.0022	0.00074	0.875	1.178
14	Drop	128	0.000998	0.000472	0.018	0.008
15	Crusher	374	0.0054	0.0024	0.157	0.283
16	Transfer Point	468	0.00014	0.000046	0.023	0.030
17	Transfer Point	375	0.00014	0.000046	0.018	0.024
18	Crusher	300	0.0012	0.00054	0.126	0.227
19	Transfer Point	157	0.00014	0.000046	0.008	0.010
20	Transfer Point	24	0.00014	0.000046	0.001	0.002
21	Drop	117	0.000998	0.000472	0.016	0.008
22	Drop	133	0.000998	0.000472	0.019	0.009
23	Transfer Point	171	0.00014	0.000046	0.008	0.001
24	Transfer Point	85	0.00014	0.000046	0.004	0.005
25	Drop	85	0.000998	0.000472	0.012	0.006
Totals					**7.709**	**4.202**

The potential PM/PM10 emissions for the source types are calculated using the following equation:

PM/PM10 PTE (tpy) = Throughput (ton/hr) * E.F. (lb/ton) * Operating hours (hr/yr) * 1.0 ton/2,000 lb

Examples of the PM/PM10 PTE calculation for various source type are shown as follows:

- PM/PM10 PTE Calculations for Drop (Emission Point 1)

PM PTE = 1,006 ton/hr * 0.000998 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = 1.405 tpy

[1] Estimated throughputs based on Metso-Bruno Process Simulation software

The controlled emissions for drop calculations assumes a 90% control efficiency for the wet dust suppression system, therefore;

PM PTE = 1.405 tpy * (1 – 0.9) = **0.1405 tpy**.

Similarly, the PM10 PTE for this source is calculated as follows:

PM PTE = 1,006 ton/hr * 0.000472 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = 0.6647 tpy

The controlled emissions for drop calculations assumes a 90% control efficiency for the wet dust suppression system, therefore;

PM PTE = 0.6647 tpy * (1 – 0.9) = **0.06647 tpy**.

The potential fugitive particulate matter emissions from the crushers, screens and transfer points are calculated using the throughput data and emissions factors for PM and PM10 from AP-42, Table 11.19.2-2.

- <u>PM/PM10 PTE Calculations for Jaw Crusher (Emission Point 2)</u>

PM PTE = 510 ton/hr * 0.0012 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **0.8568 tpy**

PM10 PTE = 510 ton/hr * 0.00054 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **0.3856 tpy**

- <u>PM/PM10 PTE Calculations for Transfer Point (Emission Point 3)</u>

PM PTE = 496 ton/hr * 0.00014 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **0.0972 tpy**

PM10 PTE = 496 ton/hr * 0.000046 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **0.0320 tpy**

- <u>PM/PM10 PTE Calculations for Screen (Emission Point 4)</u>

PM PTE = 1,006 ton/hr * 0.0022 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **3.098 tpy**

PM10 PTE = 1,006 ton/hr * 0.00074 lb/ton * 2,800 hr/yr * 1.0 ton/2,000 lb = **1.042 tpy**