AP42 Section:	11.19.1
Title:	Comments and correspondence to section

Minnesota Pollution Control Agency

January 12, 1995

Mr. Ronald E. Meyers
Emission Factor and Inventory Group
Emissions, Monitoring, and Analysis Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

RE: Comments on Revised Draft Section 11.19.1, Sand and Gravel Processing, of AP-42

Dear Mr. Meyers:

Thank you for giving staff at the Minnesota Pollution Control Agency Air Quality Division the opportunity to review the draft revision of this section of AP-42 (*Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*).

Enclosed for your consideration are our comments. If you have any questions or would like to follow up on them, please contact Jeff Peltola, of my staff, at (612)282-2603.

Sincerely,

Lisa J. Thorvig
Division Manager
Air Quality Division

LJT:lao

Enclosure

520 Lafayette Rd. N.; St. Paul, MN 55155-4194; (612) 296-6300 (voice); (612) 282-5332 (TTY)
Regional Offices: Duluth • Brainerd • Detroit Lakes • Marshall • Rochester

Minnesota Pollution Control Agency
Air Quality Division
Comments

September 1994 Draft AP-42 Section 11.19.1 (Formerly 8.19.1) Revision
and
November 8, 1994 Documentation Report

Documentation Report

page 2-1, 2nd paragraph (pr.):

Clarify that sand and gravel standard industrial classification code is "144x" ("1440" does not exist) with 1442 being for Construction Sand and Gravel and 1446 for Industrial Sand.

pages 2-4 and 2-5 are missing from the our copy of the report (including Table 2-2).

page 2-10, next to last pr., line three:

Delete "Water is sprayed..." and add "Water may be sprayed..."

page 2-10, next to last pr., line four:

Delete "...gravel is transported to storage bins,..." and add "gravel may be transported to storage piles or bins,..." (Similarly for last sentence on page.)

page 2-10, last pr.:

Separatory cones or hydroseparators may also be known (perhaps more commonly) as cyclones or hydrocyclones (to avoid confusion with the air pollution control device).

page 2-14, 2nd pr.:

It probably would be preferable to avoid the word "fugitive" here (and throughout AP-42 for that matter) because in several regulations (e.g., New Source Review, and 40 CFR 70 operating permit rules) it has very specific and important definitions. Sand and gravel processing emissions (e.g., from crushers, screens, and conveyors) are particulate matter in the form of dust, but they may be considered "nonfugitive" as opposed to "fugitive" by permitting authorities in certain cases when making regulatory applicability determinations.

page 3-2 within the first Item 3:

Separate the last sentence into its own paragraph.

page 3-3, 2nd pr.:

Indicate what "EIB" means.

page 4-3, 3rd pr.:

Using one half the detection limit for fluoranthene and phenanthrene when test results were below detection limits should not be done. A rating as high as "B" for this data set seems questionable.

pp. 4-8 and 4-9:

Tables 4-1 and 4-2 should be relabeled to more accurately reflect what they contain. In Table 4-1 delete "Processing" and add "Storage Piles." In Table 4-2 add "With Controls" to the end of the title and separate out the non-combustion processing operations. Add an additional table (new Table 4-3) for the drying data and label as "Summary of Test Data for Industrial Sand and Gravel Process Dryers."

page 4-10:

Relabel Table 4-3 as Table 4-4 to account for the change suggested above.

Proposed AP-42 Section 11.19.1, Sand and Gravel Processing

page 11.19.1-3, 2nd pr.:

In line three delete "Water is sprayed..." and add "Water may be sprayed..."
In line four delete "...gravel is transported to storage bins,..." and add "...gravel may be transported to storage piles or bins,..."

page 11.19.1-3, 3rd pr.:

In line four separatory cones or hydroseparators may also be known as hydrocyclones.
In line five delete "...sand also is transported to storage bins by..." and add "...sand also may be transported to storage piles or bins by..."

page 11.19.1-5, last pr.:

Avoid using the word "fugitive" here and in other parts of the document. See comment made previously.

page 11.19.1-6, last pr.:

A stronger statement should be made on the suitability of using the corresponding process emission factors from Section 11.19.2, Crushed Stone Processing, for sand and gravel processing. A suggested rewording of the sentence in the middle of the paragraph is: "In the absence of other data, it is appropriate to use the emission factors presented in Section 11.19.2 of AP-42 for the corresponding sand and gravel processing sources." Regarding dust emissions from piles and roads, the reader should also be directed to the appropriate AP-42 section (e.g., currently numbered Sections 11.2.11 and 1.2.3.), not just to the background report for Section 11.19.1.

pages 11.19.1-7, Table 11.19.1-1:

See previous comment regarding the separation and relabeling of Tables 4-x in the documentation report.

pages 11.19.1-8, Table 11.19.1-2:

Even though there is an overall lack of emission factors for Hazardous Air Pollutants (HAP), the usefulness of including these in a sand and gravel processing chapter is questionable, especially given the low quality/representativeness of the test data for these compounds. The quantity of HAP emissions is more a function of the amount of fuel burned and not the amount of material dried. Perhaps the emission factors for combustion products from dryers should be included in other sections of AP-42 that pertain to fuel combustion. The reader of the sand and gravel section could be directed to other relevant sections for information on dryer combustion emissions.

LJT:lao

South Coast
AIR QUALITY MANAGEMENT DISTRICT
21865 E. Copley Drive, Diamond Bar, CA 91765-4182 (909) 396-2000

February 6, 1995

Mr. Ronald E. Myers
Emission Factor and Inventory Group
Emissions, Monitoring, and Analysis Division
United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Subject: AP-42, Section 11.19.1, Sand and Gravel Processing Draft

Dear Mr. Myers:

I recently received your letter addressed to Mr. Dan Vasquez. Mr. Vasquez advised me to review the letter and attachments, and send a letter to you indicating my comments to the draft AP-42 section. The following are my comments to the draft document attached to your letter:

1. In the aggregate industry such terms as rock, aggregate, sand, and gravel are used in everyday conversation without regard as to a specific meaning to any one term. The true meaning of each term could be different depending on who you speak to. As a result, I suggest that whenever anyone of these terms is initially indicated a more specific definition should also be included, such as a range of mesh sizes, examples of eventual product usage, examples of specific industries using the product, etc. A look at the existing AP-42 Sections below, shows that there could be some overlap:

    8.19.1 Sand and Gravel Processing
    8.19.2 Crushed Stone Processing
    8.20 Stone Quarrying and Processing (previously deleted)

    The overlap has caused some confusion for me and others that I work with as to what emission factors to use for a specific process or industry. Is there a distinction between sand and gravel that needs to be addressed in either the description of process or table 11.19.1-1? Why is only sand processing indicated in this table?

2. PM10 factors, or at least a conversion factor from PM, should be identified in the emission factor table.

3. Emission factors for crushing, screening, and grinding should also be identified?

If you should have any questions regarding these comments please call me at (909) 396-2657.

Sincerely,

Richard H. Hawrylew, P.E.
A.Q. Engineer II

cc: D. Vasquez

D7-EPAP42CL

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 12, 1995

Mr. Ronald E. Myers
Emission Factor & Inventory Group
Emissions Monitoring & Analysis Division
United States Environmental
Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Re: Revised Emission Factors
Section 11.19.1
Sand and Gravel
Processing Facilities

Dear Mr. Myers:

Thank you for contacting the Texas Natural Resource Conservation Commission regarding the proposed revisions to Section 11.19.1 of AP-42. For many months, our New Source Review Program has been analyzing the new emission factors for limestone crushing, as well as for sand and gravel handling facilities.

Based on this analysis, we believe that the new factors more accurately predict worst-case air emissions from facilities of this type than do those currently listed in the referenced AP-42 Section. Due to this fact, we have been using the new factors and anxiously await your revisions to AP-42.

Thank you for your time and consideration.

Sincerely,

Gary L. Wallin
Mechanical Section Manager
New Source Review Program

cc: Mr. Doyle Pendleton, Deputy Director, Office of Air Quality, TNRCC, Austin
Mr. Jim Thomas, Manager, Emissions Inventory Section, TNRCC, Austin

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

Stevens T. Mason Building, P.O. Box 30028, Lansing, MI 48909

ROLAND HARMES, Director

January 10, 1995

Mr. Ronald E. Myers
Emission Factor and Inventory Group
Emissions, Monitoring, and Analysis Division
United State Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

Dear Mr. Myers:

I have been asked by Mr. Dennis Drake, Chief of the Michigan Department of Natural Resources, Air Quality Division, to respond to your two letter of December 2, 1994 requesting comments on AP-42 revised draft Sections 11.19.1, Sand and Gravel Processing and 11.23, Taconite Ore Processing. I hereby offer the following comments:

Section 11.19.1 - Sand and Gravel Processing

1. This proposed draft section contains no reference to Section 13.2 for information on estimating fugitive emissions. Page 4-14 of your draft report on the preparation of draft Section 11.19.1 indicates that a reference to Section 13.2 will be included in Section 11.19.1. A similar reference has been included in draft Section 11.23.

2. The ratings on the proposed revised emission factors are still low (C & E) and are quite similar to those on the current emission factors. How confident is EPA that the revised factors are really any better than the current factors?

3. Include diagrams in the section which show examples of the actual pieces of process and control equipment used by this industry.

Section 11.23 - Taconite Ore Processing

1. The ratings on the proposed revised emission factors (mostly Ds and Es, but nothing greater than C) are low. How confident is EPA that the revised factors are really any better than the current factors?

2. Include diagrams in the section which show examples of the actual pieces of process and control equipment used by this industry.

I hope these comment are of help to you. Feel free to call me at 517-373-7077 if you have any questions on them.

Sincerely,

Mark C. Mitchell

Mark C. Mitchell, P.E.
General Manufacturing Unit
Permit Section
Air Quality Division
517-373-7077

MCM:cmb
cc: Dennis Armbruster

STATE OF CALIFORNIA
AIR RESOURCES BOARD
2020 L STREET
P.O. BOX 2815
SACRAMENTO, CA 95812

PETE WILSON, Governor

January 23, 1995

Mr. Ronald E. Myers
Emission Factor and Inventory Group
Emissions, Monitoring, and Analysis Division
United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Dear Mr. Myers:

Comments on Draft AP-42, Section 11.19.1, Sand and Gravel Processing

Thank you for your letter to Mr. James Boyd, inviting the Air Resources Board to review the U.S Environmental Protection Agency's (U.S. EPA) draft AP-42 Section 11.19.1 for Sand and Gravel Processing. We support EPA's work in updating the sand and gravel emission factors, especially since California is the nation's largest sand and gravel producer, mining over 15 percent of the 900 million tons produced annually in the United States.

In the future, to make these emission factors more directly relevant to our needs, we would like to make two suggestions.

1. The supporting documentation indicates that there were not enough valid source tests to provide complete sand and gravel emission factors. We urge the EPA to initiate steps to acquire emission factors for construction sand and gravel, which accounts for over 96 percent of the sand and gravel produced nationally.

2. Future AP-42 methods for estimating particulate matter emissions should be developed for PM10.

These two components will make the AP-42 sand and gravel emission factor update much more useful and relevant to our needs to estimate PM10 emissions.

Based upon the supplemental documentation to Section 11.19.1, we understand that the emission factor limitations were due to a lack of adequate source test data. From the documentation, it seems that additional tests may be needed or that more existing tests need to be identified which can be used to generate construction sand and gravel and PM10 emission factors. I have attached a detailed analysis of the draft AP-42, Section 11.19.1 for sand and gravel processing. We have limited our comments to particulate matter emissions. With our current emphasis on PM10, we consider particulate matter to be the most important pollutant emitted from these plants. Existing PM emission factors from sand and gravel processing have extremely high uncertainties.

We support EPA continuing its efforts to update the sand and gravel emission factors to include PM10 emission factors for sand and gravel operations, particularly for construction sand and gravel operations. With the upcoming federal PM10 State Implementation Plan requirements nearly upon us, the urgency for this information is great.

If you have specific questions regarding our comments, please contact Patrick Gaffney of my staff at (916) 322-7303. You are also welcome to contact me directly at (916) 322-5350.

Once again, we appreciate your consideration of these comments, and thank you for the opportunity to review the draft AP-42, Section 11.19.1.

Sincerely,

Terry McGuire, Chief
Technical Support Division

Attachment

cc: James Boyd
Mike Scheible
Patrick Gaffney

ATTACHMENT

Review of AP-42 Section 11.19.1, Sand and Gravel Processing

We appreciate EPA's work in updating the sand and gravel processing emission factors in AP-42, and appreciate being invited to review the new, draft Section 11.19.1. The emission factors provided and the methods used to derive them appear to be well documented and supported.

We do have some concerns about the lack of emission factors for all **construction** sand and gravel processes and the lack of any PM10 emission factors. This attachment discusses these concerns. We begin with a discussion of the missing construction sand and gravel emission factors, and then the missing PM10 factors.

As information in the "Emission Factor Documentation for AP-42, Section 11.19.1" by Midwest Research Institute (MRI, Project No. 4602.01) shows, more than 900 million tons of sand and gravel are produced in the United States annually. Over 96 percent of this total is considered construction sand and gravel; about 3 percent is industrial sand. Unfortunately, the draft AP-42, Section 11.19.1 includes emission factors for only industrial sand processing (these have an emission factor rating D on EPA's A to E scale). It does not include emission factors for construction sand and gravel processes. AP-42 also states that the industrial sand factors are not to be used for construction sand and gravel processes. It is unfortunate that further tests were not available to generate adequate emission factors for the predominant sand and gravel processes, but the supporting documentation clearly describes the limitations.

Section 11.19.1 does suggest using AP-42 Section 11.19.2, Crushed Stone Processing, for construction sand and gravel process emission factors. However, we believe that the crushed stone emission factors provided in 11.19.2 are probably not applicable for sand and gravel processing. It is likely that using these factors has the potential to underestimate particulate matter emissions caused by sand and gravel processing. This is based primarily on the fact that for crushed stone processing, the silt content (i.e., particles < 75 microns) of the material is 1.4 to 3.5 percent (from the Brian Shrager to Ron Myers memo dated May 11, 1994, "Background Information for Revised AP-42 Section 11.19.2, ..."). Although no silt values are included in the provided documents for sand and gravel, the percent silt can be expected to be much higher for sand and gravel feedstocks because most sand and gravel is mined from alluvial deposits and underwater beds, which are very likely to have a higher proportion of small particles than mined and crushed stone.

Also, the crushed stone processes which are most applicable to sand and gravel processing are fines **crushing** with and without wet suppression, and fines **screening** with and without wet suppression. The suggested crushed stone screening and crushing emission factors for these four processes are based on one test each at a single plant. The EPA rating for these four emission factors is E, the lowest rating, which means that the emission

factors were developed from low rated data and there is reason to suspect that the facilities tested do not represent a random sample of the industry.

Finally, in regards to using the Crushed Stone Processing emission factors for sand and gravel processing, the crushed stone emission factors are based on eight reports by three authors. The compilation of the crushed stone emission factors derived from these reports has an average rating of less than D (based on EPA's A-E emission factor rating scale). In light of this, using these factors for sand and gravel might not be the most desirable approach.

Regarding PM10 emission factors for sand and gravel processing, it would be extremely helpful to us to include factors for estimating PM10 emissions from these processes. With the national emphasis on PM10 emissions, it is increasingly necessary to have PM10 emission factors for those sources which generate PM10 emissions.

We also noticed that for industrial sand only, emission factors are provided for "Filterable PM" which is defined as "PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train," (from the draft section, Table 11.19.1-1). This is not consistent with previous methods of providing PM emission factors and its usability is questionable for regulators and industry staff attempting to use the provided factors to estimate airborne PM and PM10 emissions. To further emphasize this, Note C of Table 11.19.2-2 states that, "... total suspended particulate (TSP) emissions can be estimated by multiplying the filterable PM emission factor by 0.80. However, no data are available to support this approximation..." We strongly suggest that future particulate sampling emphasize PM10 and even PM2.5 measurements, and not filterable PM.

We understand, as the MRI documentation describes, that there were limitations in what data were available to generate the sand and gravel emission factors. Several of the industrial sand factors are based on only one or two tests and nearly all of them have a "D" rating (on a scale of A-E). As the MRI report states, a "D" rating means that the factors were developed from data from a small number of facilities and there is reason to suspect that the facilities do not represent a random sample of the industry. Because of the incomplete emission factors, it appears that it may be necessary to perform further monitoring studies or determine if there are additional studies already available which could be beneficial to EPA's efforts.

We do understand the difficulties in compiling national emission factors and in pulling together uncoordinated test reports done at different times in different parts of the country to formulate reasonable data. We want to thank those involved in producing the excellent supplemental documentation to the new AP-42 sections. It was invaluable in performing this analysis and will be very helpful to those of us considering using the updated emission factors. The work involved in improving these emission factors is important and may become even more significant with the review of the PM standards in 1997.

We appreciate your consideration of these comments. If you need any clarification please contact Patrick Gaffney of the California Air Resources Board at (916) 322-7303.

NATIONAL AGGREGATES ASSOCIATION

900 Spring Street
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United States of America
(301) 587-1400
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December 30, 1994

Mr. Ronald E. Meyers
Emission Factor and Inventory Group
Emissions Monitoring and Analysis Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Mr. Meyers:

Rick Meininger has passed on to me the revised draft and associated report relative to the Sand and Gravel Processing Section (11.19.1) of the Compilation of Air Pollutant Emission Factors handbook, AP-42. The comments below are the result of several staff members' review including collaboration by Rick and me. We appreciate the opportunity to provide our comments on behalf of the National Aggregates Association (NAA).

As you may or may not recall, NAA (then known as the National Sand and Gravel Association) was heavily involved with your office in the early 1980's, with regard to updating AP-42 relative to the sand and gravel emission factors. Data was compiled in conjunction with EPA and EPA-approved test protocols. Much has occurred since then, in particular further testing and updating of the crushed stone emission factors which were previously revised in the 1980's in conjunction with the sand and gravel emission factors.

We agree with and appreciate the draft recommendation that absent new data, the emission factors presented in Section 11.19.2, crushed stone processing, should be used to estimate emissions from similar sources at sand and gravel operations . For a variety of reasons, the sand and gravel emission factors have historically been lower than the corresponding factors in the crushed stone industry. This is probably due to wet processing, a higher surface moisture content on aggregate products, and less intensive processing. Since new data from tests accepted by EPA have resulted in a significant lowering of crushed stone emission factors to a point below the current sand and gravel emission factors, it is appropriate that the Agency suggest the more recent crushed stone factors be used until new data is available with specific application to the sand and gravel industry. While we are seeking submission of test data that may have been undertaken in the last several years, we are not at this time aware of any new data following our mutual efforts during the 1980's, which are reflected in the current AP-42 sand and gravel processing section.

We also feel that it is very appropriate that the draft specifically not recommend emission factors from industrial sand operations as surrogates for construction sand and gravel processing, since the industrial sand emission factors are from dried sands and are likely to result in over estimating emissions from sand and gravel processing.

As a matter of fact, we believe that, generally speaking, there is such a difference between construction sand and gravel processing and industrial sand processing that they should not be included together in one AP-42 section. It would be better and make more sense, if the two industries had there own AP-42 sections. Page 2-1 of the MRI Report incorrectly states that there is no distinction between construction and industrial sand and gravel according to the federal government's Standard Industrial Classification (SIC), the most recent of which was published in 1987. I am enclosing excerpts from the 1987 SIC Manual relative to major group 14 -- Mining and Quarrying of Nonmetallic Minerals, Except Fuels. This is a broad group which includes, in addition to construction and industrial sand and gravel: crushed and dimension stone; clay; ceramic and refractory minerals; phosphate; pot ash; and perhaps 75 additional nonmetallic minerals. Paragraph 2 of page 2-1 in the MRI Report is just plain incorrect in asserting that sand and gravel are the only industries classified under SIC code 1440. As you can see from the enclosed excerpts, construction sand and gravel has its own SIC code which is 1442 and industrial sand has its own SIC code which is 1446. We believe that keeping this distinction is important for the sake of accuracy and to minimize unnecessary confusion.

The process flow diagram for construction sand and gravel processing (Figure 2-1 on page 2-11 of the draft MRI Report and repeated as Figure 11.19.1-1 in the proposed AP-42 section) would be more appropriate as a guide for a typical sand and gravel operation if it somehow indicated, as does the text, that many typical operations do no crushing. Also, it should be indicated on the flow diagram that fine screening and/or rodmilling is rarely done in construction sand and gravel operations. Grading of sand products is almost universally done using wet methods of hydraulic classification. The discussion of control technology on page 2-15 of the MRI Report, while presenting a caveat, gives the impression that the use of cyclones, wet scrubbers, venturi scrubbers, and fabric filters are more common at sand and gravel facilities than is the case.

The process flow diagram for construction sand and gravel processing (Figure 11.19.1-1 on page 11.19.1-2 of the draft AP-42 section on sand and gravel processing) has the same problems alluded to above for the first process flow diagram. We believe that the third paragraph of page 11.19.1-3 of the draft with reference of rodmilling to produce smaller size fractions, should be written as to indicate rodmilling takes place in only a very small percentage of sand and gravel facilities. For your convenience I am enclosing a marked up copy of AP-42 proposed Section 11.19.1 by Rick Meininger. It includes some editorial corrections, minor revisions, and suggested modifications to better characterize the construction sand and gravel industry.

We, of course, wish there were more acceptable data directly from sand and gravel operations from which reliable AP-42 emission factors could be based. While we have limited staff and financial resources, NAA is willing to cooperate with EPA to assist in coordination of studies that will provide more up-to-date and accurate assessments of representative data from sand and gravel operations, if so desired by the Agency.

Generally speaking, we again want to reiterate that, given the limited data available, the Agency has done a good job in making the practical assessment that the recently revised stone data can be used in the interim to estimate emissions from corresponding sand and gravel sources. We thank you again for the opportunity to review the aforementioned draft and would be pleased to cooperate with your office in any way appropriate.

Sincerely,

Richard A. Morris

Richard A. Morris
Vice President of Government
Relations and Public Affairs

RAM/dep

Enclosures

cc: Richard C. Meininger, NAA Vice President of Research

Major Group 14.—MINING AND QUARRYING OF NONMETALLIC MINERALS, EXCEPT FUELS

The Major Group as a Whole

This major group includes establishments primarily engaged in mining or quarrying, developing mines, or exploring for nonmetallic minerals, except fuels. Also included are certain well and brine operations, and primary preparation plants, such as those engaged in crushing, grinding, washing, or other concentration.

Establishments primarily engaged in manufacturing cement are classified in Industry 3241; those engaged in manufacturing lime are classified in Industry 3274; those engaged in cutting and finishing stone and stone products are classified in Industry 3281; and those engaged in manufacturing brick and other structural clay products are classified in Industry Group 325.

Establishments primarily engaged in crushing, pulverizing, or otherwise treating earths, rocks, and minerals mined in Industry Group 145 or 149; or barite mined in Industry 1479, not in conjunction with mining or quarrying operations, are classified in Manufacturing, Industry 3295; establishments primarily engaged in these activities in conjunction with mines or quarries are classified in Mining. Establishments primarily engaged in crushing, pulverizing, or otherwise treating other nonmetallic minerals are classified in Mining, whether or not they are operated in conjunction with mines.

Establishments primarily engaged in manufacturing other stone, clay, glass, and concrete products from minerals mined at the same establishment are classified in Manufacturing, Major Group 32, when separate reports are not available for the mining and manufacturing activities.

Industry Group No.	Industry No.	
141		DIMENSION STONE
	1411	Dimension Stone

Establishments primarily engaged in mining or quarrying dimension stone. Also included are establishments engaged in producing rough blocks and slabs. Establishments primarily engaged in mining dimension soapstone or in mining or quarrying and shaping grindstones, pulpstones, millstones, burrstones, and sharpening stones are classified in Industry 1499. Establishments primarily engaged in dressing (shaping, polishing, or otherwise finishing) blocks and slabs are classified in Manufacturing, Industry 3281. Nepheline syenite mining operations are classified in Industry 1459.

Argillite, dimension—quarrying
Basalt, dimension—quarrying
Bluestone, dimension—quarrying
Calcareous tufa, dimension—quarrying
Diabase, dimension—quarrying
Diorite, dimension—quarrying
Dolomite, dimension—quarrying
Dolomitic marble, dimension—quarrying
Flagstone mining
Gabbro, dimension—quarrying
Gneiss, dimension—quarrying
Granite, dimension—quarrying
Greenstone, dimension—quarrying
Limestone, dimension—quarrying
Marble, dimension—quarrying
Mica schist, dimension—quarrying
Onyx marble, dimension—quarrying
Quartzite, dimension—quarrying
Rubble mining
Sandstone, dimension—quarrying
Serpentine, dimension—quarrying
Slate, dimension—quarrying
Syenite (except nepheline), dimension—quarrying
Trap rock, dimension—quarrying
Travertine, dimension—quarrying
Verde' antique, dimension—quarrying
Volcanic rock, dimension—quarrying

Industry Group No.	Industry No.
142	1422
	1423
	1429
144	1442

Industry Group No. | Industry No.

142 CRUSHED AND BROKEN STONE, INCLUDING RIPRAP

1422 Crushed and Broken Limestone

Establishments primarily engaged in mining or quarrying crushed and broken limestone, including related rocks, such as dolomite, cement rock, marl, travertine, and calcareous tufa. Also included are establishments primarily engaged in the grinding or pulverizing of limestone, but establishments primarily engaged in producing lime are classified in Manufacturing, Industry 3274.

Calcareous tufa, crushed and broken—quarrying
Cement rock, crushed and broken—quarrying
Chalk mining, crushed and broken—quarrying
Dolomite, crushed and broken—quarrying
Lime rock, ground
Limestone, except bituminous: crushed and broken—quarrying
Marl, crushed and broken—quarrying
Travertine, crushed and broken—quarrying
Whiting mining, crushed and broken—quarrying

1423 Crushed and Broken Granite

Establishments primarily engaged in mining or quarrying crushed and broken granite, including related rocks, such as gneiss, syenite, and diorite.

Diorite, crushed and broken—quarrying
Gneiss, crushed and broken—quarrying
Granite, crushed and broken—quarrying
Syenite, except nepheline: crushed and broken—quarrying

1429 Crushed and Broken Stone, Not Elsewhere Classified

Establishments primarily engaged in mining or quarrying crushed and broken stone, not elsewhere classified.

Basalt, crushed and broken—quarrying
Boulder, crushed and broken—quarrying
Diabase, crushed and broken—quarrying
Dolomitic marble, crushed and broken—quarrying
Gabbro, crushed and broken—quarrying
Ganister, crushed and broken—quarrying
Grits mining (crushed stone)
Marble, crushed and broken—quarrying
Mica schist, crushed and broken—quarrying
Onyx marble, crushed and broken—quarrying
Quartzite, crushed and broken—quarrying
Riprap quarrying, except limestone or granite
Sandstone, except bituminous: crushed and broken—quarrying
Serpentine, crushed and broken—quarrying
Slate, crushed and broken—quarrying
Trap rock, crushed and broken—quarrying
Verde' antique, crushed and broken—quarrying
Volcanic rock, crushed and broken—quarrying

144 SAND AND GRAVEL

1442 Construction Sand and Gravel

Establishments primarily engaged in operating sand and gravel pits and dredges, and in washing, screening, or otherwise preparing sand and gravel for construction uses.

Common sand mining
Construction sand mining
Gravel mining
Pebble mining

Industry Group No. | Industry No.

144 **SAND AND GRAVEL—Con.**

1446 Industrial Sand

Establishments primarily engaged in operating sand pits and dredges, and in washing, screening, and otherwise preparing sand for uses other than construction, such as glassmaking, molding, and abrasives.

- Abrasive sand mining
- Blast sand mining
- Enamel sand mining
- Filtration sand mining
- Foundry sand mining
- Glass sand mining
- Grinding sand mining
- Industrial sand mining
- Molding sand mining
- Silica mining
- Silica sand mining

145 **CLAY, CERAMIC, AND REFRACTORY MINERALS**

Establishments primarily engaged in mining, milling, or otherwise preparing clays and refractory minerals. Mines operated in conjunction with plants manufacturing cement, brick or other structural clay products, or pottery and related products, are included in this industry when separate reports are available. Establishments primarily engaged in grinding, pulverizing, or otherwise treating clay, ceramic, and refractory minerals not in conjunction with mining or quarrying operations are classified in Manufacturing, Industry 3295.

1455 Kaolin and Ball Clay

Establishments primarily engaged in mining, milling, or otherwise preparing kaolin or ball clay, including china clay, paper clay, and slip clay.

- Ball clay mining
- China clay mining
- Kaolin mining
- Paper clay mining
- Rubber clay mining
- Slip clay mining

1459 Clay, Ceramic, and Refractory Minerals, Not Elsewhere Classified

Establishments primarily engaged in mining, milling, or otherwise preparing clay, ceramic, or refractory minerals, not elsewhere classified. Establishments producing clay in conjunction with the manufacture of refractory or structural clay and pottery products are classified in Manufacturing, Major Group 32.

- Andalusite mining
- Aplite mining
- Bentonite mining
- Brucite mining
- Burley mining
- Clays (common) quarrying—not in conjunction with manufacturing
- Cornwall stone mining
- Cyanite mining
- Diaspore mining
- Dumortierite mining
- Feldspar mining
- Fire clay mining
- Flint clay mining
- Fuller's earth mining
- Kyanite mining
- Magnesite mining
- Nepheline syenite quarrying
- Olivine (nongem) mining
- Pegmatite (feldspar) mining
- Pinite mining
- Plastic fire clay mining
- Shale (common) quarrying-not in conjunction with manufacturing
- Sillimanite mining
- Stoneware clay mining
- Syenite, nepheline—quarrying
- Topaz (nongem) mining

147 **CHEMICAL AND FERTILIZER MINERAL MINING**

1474 Potash, Soda, and Borate Minerals

Establishments primarily engaged in mining, milling, or otherwise preparing natural potassium, sodium, or boron compounds. Establishments primarily engaged in mining common salt are classified in Industry 1479.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET

STANDARD INDUSTRIAL CLASSIFICATION MANUAL

1987

Marked up by R. C. Meininger, NAA 12-29-94

11.19.1 SAND AND GRAVEL PROCESSING

11.19.1.1 Process Description[1-5]

Deposits of sand and gravel, the unconsolidated granular materials resulting from the natural disintegration of rock or stone, are generally found in near-surface alluvial deposits and in subterranean and subaqueous beds. Sand and gravel are products of the weathering of rocks and unconsolidated or poorly consolidated materials and consist of siliceous and calcareous components. Such deposits are common throughout the country. The six-digit Source Classification Code (SCC) for sand and gravel processing is 3-05-025.

Construction Sand and Gravel

Sand and gravel typically are mined in a moist or wet condition by open pit excavation or by dredging. Open pit excavation is carried out with power shovels, draglines, front end loaders, bucket wheel excavators, and belt conveyors. In rare situations, light charge blasting is done to loosen the deposit. Mining by dredging involves mounting the equipment on boats or barges and removing the sand and gravel from the bottom of the body of water by suction or bucket-type dredges. After mining, the materials are transported to the processing plant by suction pump, earth mover, barge, truck, or other means.

Although significant amounts of sand and gravel are used for fill (e.g., bedding, subbase, and base course) without processing, most domestic sand and gravel is processed prior to use. The processing of sand and gravel for a specific market involves the use of different combinations of washers, screens, and classifiers to segregate particle sizes; crushers to reduce oversized material; and storage and loading facilities. A process flow diagram for construction sand and gravel processing is presented in Figure 11.19.1-1. The following paragraphs describe the process in more detail.

After being transported to the processing plant, the wet sand and gravel raw feed is stockpiled or emptied directly into a hopper, which typically is covered with a "grizzly" of parallel bars to screen out large cobbles and boulders. From the hopper, the material is transported to fixed or vibrating scalping screens by belt, gravity, hydraulic pump, or bucket elevators. The scalping screens separate the oversize material from the smaller marketable sizes. The oversize material may be directed to a crusher for size reduction, to produce

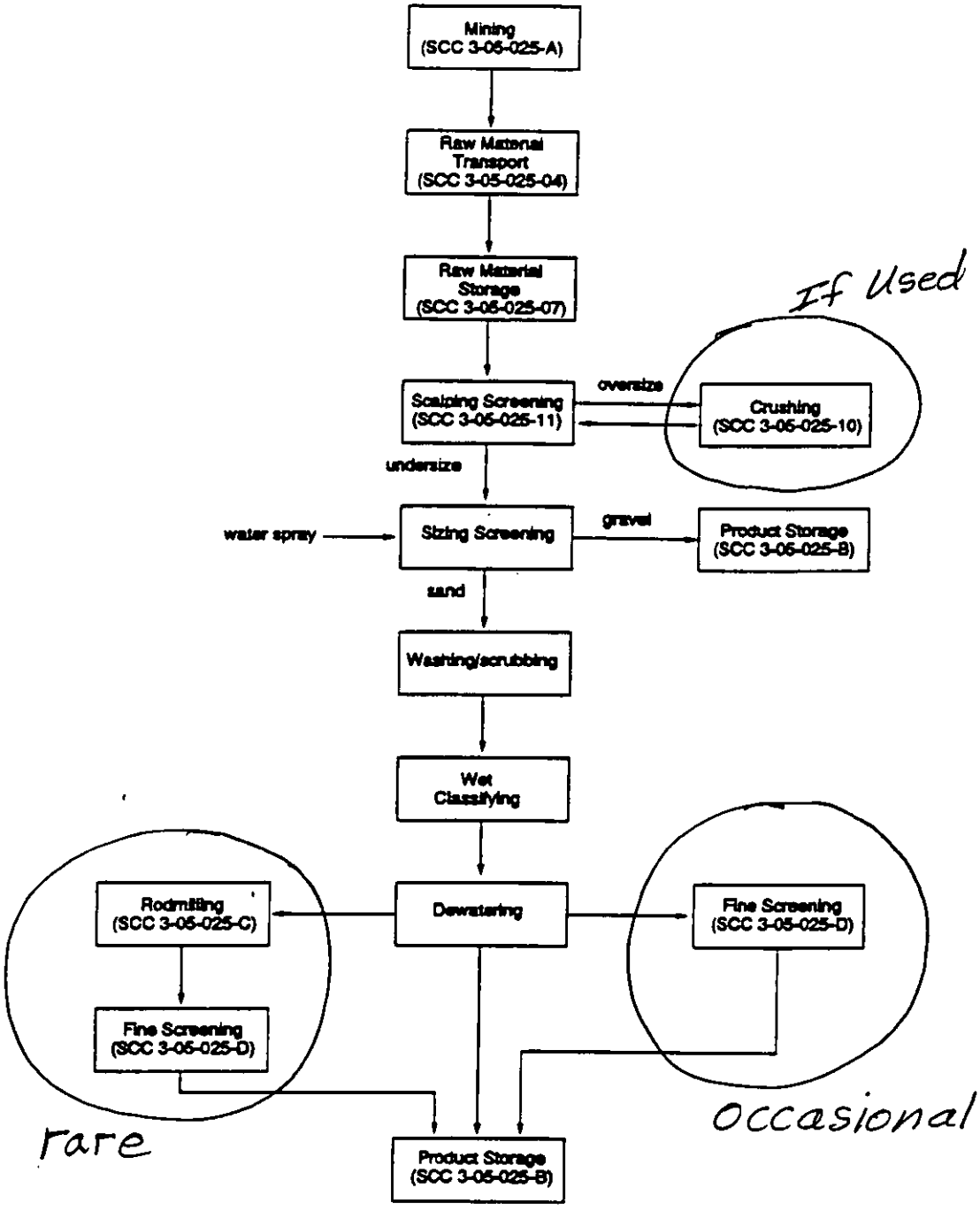

Figure 11.19.1-1. Process flow diagram for construction sand and gravel processing. (Source Classification Codes in parentheses.)

angular shaped aggregate, or to produce the finer sizes of sands. Crushing generally is carried out in one or two stages, although three-stage crushing may also be performed. Followirg crushing, the material is returned to the screening operation for sizing. Alternatively, oversize may be kept seperate for use in erosion control work applications, reclamation or other uses.

The material that passes through the scalping screen is fed into a battery of sizing screens, which generally consist of horizontal or sloped, single or multideck vibrating screens. Screening separates the sand and gravel into different size ranges. Water is sprayed onto the material throughout the screening process. After screening, the sized gravel is transported to storage bins, or, in some cases, to crushers by belt conveyors, bucket elevators, or screw conveyors.

Rotating trommel screens with water sprays are also used to process and wash wet sand and gravel.

The sand is freed from clay and organic impurities by log washers or rotary scrubbers. After scrubbing, the sand is sized typically by water classification, although both wet and dry screening and air separation also are used to size the sand. After classification, the sand is dewatered using separatory cones or hydroseparators, followed by fine screening for grading. The sand may also be rodmilled to produce smaller sized fractions. After processing, the sand also is transported to storage bins by belt conveyors, bucket elevators, or screw conveyors.

<u>Industrial Sand and Gravel</u>

Industrial sand and gravel typically is mined from open pits of naturally occurring quartz-rich sand and sandstone. Mining methods depend primarily on the degree of cementation of the rock. In some deposits, blasting is required to loosen the material prior to processing. The material may undergo primary crushing at the mine site before being transported to the processing plant. Figure 11.19.1-2 is a flow diagram for industrial sand and gravel processing.

The mined rock is transported to the processing site and stockpiled. The material then is crushed. Depending on the degree of cementation, several stages of crushing may be required to achieve the desired size reduction. Gyratory crushers, jaw crushers, roll crushers, and impact mills are used for primary and secondary crushing. After crushing, the size of the material is further reduced by grinding using smooth rolls, media mills, autogenous mills, hammer mills, or jet mills, to 50 micrometers (μm) or smaller. The ground material then is classified by wet screening, dry screening, or air classification. At some plants, after initial crushing and screening, a portion of the sand may be diverted to construction sand use.

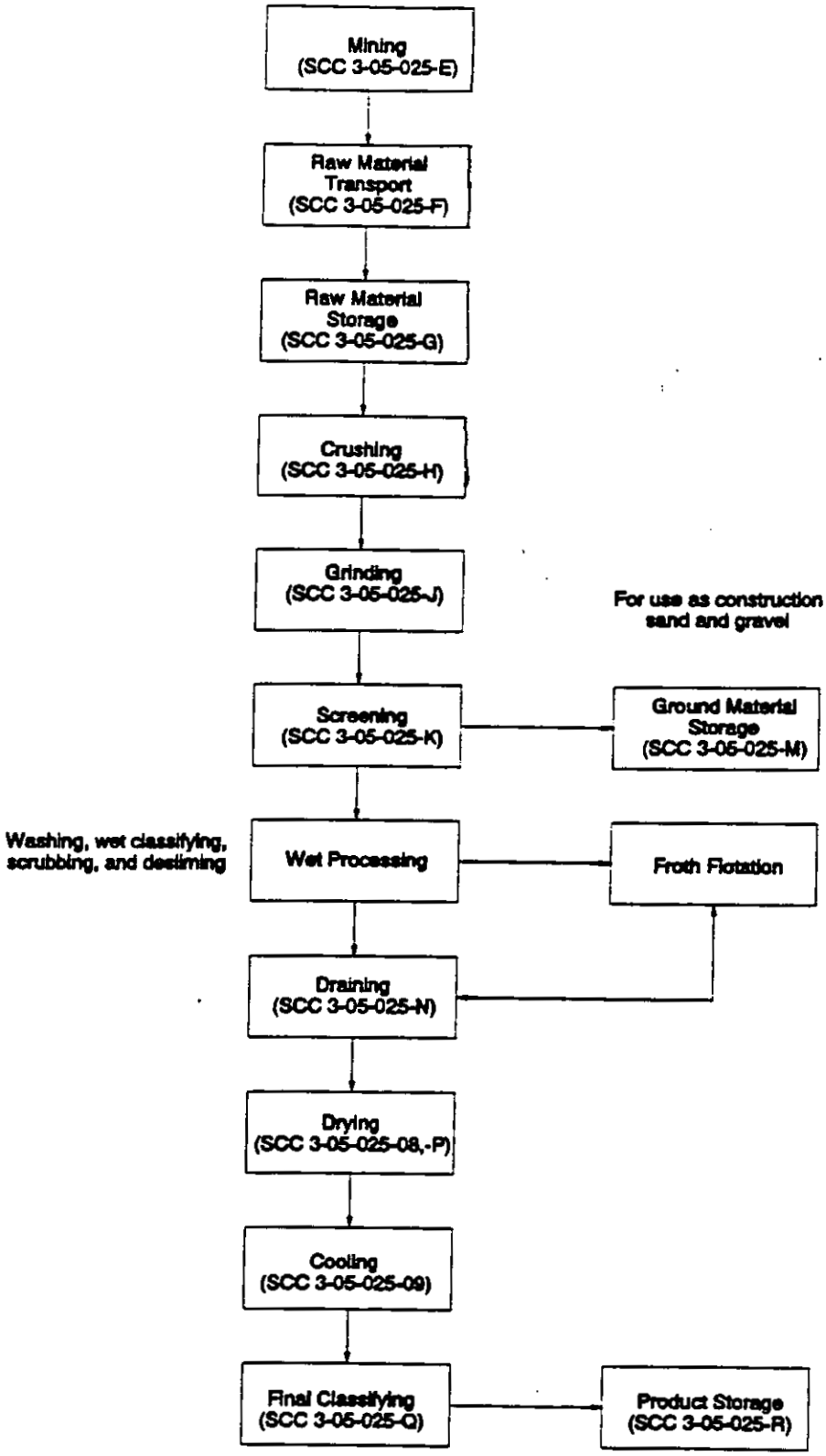

Figure 11.19.1-2. Process flow diagram for industrial sand and gravel processing. (Source Classification Codes in parentheses.)

After initial crushing and screening, industrial sand and gravel are washed to remove unwanted dust and debris, and screened and classified again. The sand (now containing 25 to 30 percent moisture) or gravel then goes to an attrition scrubbing system that removes surface stains from the material by rubbing in an agitated, high density pulp. The scrubbed sand or gravel is diluted with water to 25 to 30 percent solids and pumped to a set of cyclones for further desliming. If the deslimed sand or gravel contains mica, feldspar, and iron bearing minerals, it enters a froth flotation process where sodium silicate and sulfuric acid are added. The mixture then enters a series of spiral classifiers where the impurities are floated in a froth product and diverted to waste. The flotation product, which has a moisture content of 15 to 25 percent, is conveyed to drainage bins where the moisture content is reduced to about 6 percent. The material is then dried to a moisture content of less than 0.5 percent in rotary or fluidized bed dryers. The dryers generally are fired with natural gas or oil, although other fuels such as propane or diesel also may be used. After drying, the material is cooled and then undergoes final screening and classification prior to being stored and packaged for shipment.

11.19.1.2 Emissions and Controls[6-13]

Emissions from the production of sand and gravel consist primarily of particulate matter (PM) and particulate matter less than 10 micrometers (PM-10) in aerodynamic diameter, that are emitted by many operations at sand and gravel processing plants, such as conveying, screening, crushing, and storing operations. Generally, these materials are wet or moist when handled, and process emissions are often negligible. A substantial portion of these emissions may consist of heavy particles that settle out within the plant. Other potentially significant sources of PM and PM-10 emissions are haul roads. Emissions from dryers include PM and PM-10, as well as typical combustion products including CO, CO_2, and NO_x. In addition, dryers may be sources of volatile organic compounds (VOC) or sulfur oxides (SO_x) emissions depending on the type of fuel used to fire the dryer.

With the exception of drying, emissions from sand and gravel operations primarily are in the form of fugitive dust, and control techniques applicable to fugitive dust sources are appropriate. Some successful control techniques used for haul roads are application of dust suppressants, paving, route modifications, and soil stabilization; for conveyors, covering and wet suppression; for storage piles, wet suppression, windbreaks, enclosure and soil stabilizers; and for conveyor and batch transfer points, wet suppression and various methods to reduce freefall distances (e. g., telescopic chutes,

stone ladders, and hinged boom stacker conveyors); for screening and other size classification, covering and wet suppression.

Wet suppression techniques include application of water, chemicals and/or foam, usually at crusher or conveyor feed and/or discharge points. Such spray systems at transfer points and on material handling operations have been estimated to reduce emissions 70 to 95 percent. Spray systems can also reduce loading and wind erosion emissions from storage piles of various materials 80 to 90 percent. Control efficiencies depend upon local climatic conditions, source properties and duration of control effectiveness. Wet suppression has a carryover effect downstream of the point of application of water or other wetting agents, as long as the surface moisture content is high enough to cause the fines to adhere to the larger rock particles.

In addition to fugitive dust control techniques, some facilities use add-on control devices to reduce emissions of PM and PM-10 from sand and gravel processing operations. Controls in use include cyclones, wet scrubbers, venturi scrubbers, and fabric filters. Use of these types of controls is more common at industrial sand processing facilities than at other sand and gravel processing plants.

Emission factors for criteria pollutant emissions from industrial sand and gravel processing are presented in Table 11.19.1-1 (metric and English units), and emission factors for organic pollutant emissions from industrial sand and gravel processing are presented in Table 11.19.1-2 (metric and English units). Although no emission factors are presented for construction sand and gravel processing, emission factors for the crushing, screening, and handling and transfer operations associated with stone crushing can be found in Section 11.19.2 of AP-42. In the absence of other data, the emission factors presented in Section 11.19.2 can be used to estimate emissions from corresponding sand and gravel processing sources. The background report for this AP-42 section also presents factors for the combined emissions of total suspended particulate from construction gravel storage pile wind erosion, material handling, and vehicle traffic. However, because the applicability of those emission factors to other storage piles is questionable, they are not presented in this AP-42 section. The emission factors for industrial sand storage and screening presented in Table 11.19.1-1 are not recommended as surrogates for construction sand and gravel processing because they are based on emissions from dried sand and may result in overestimates of emissions from those sources.

Consideration must be given to the moisture on the materials. Usually construction sand and gravel is maintained in a wet condition during processing.

Draft Table 11.19.1-1 (Metric and English Units).
EMISSION FACTORS FOR INDUSTRIAL SAND AND GRAVEL PROCESSING[a]

EMISSION FACTOR RATING: D

Source	Filterable PM[b]		NO_x		CO_2	
	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton
Sand dryer (SCC 3-05-025-08)	0.98[c]	2.0[c]	0.016[d]	0.031[d]	14[e]	27[e]
Sand dryer with wet scrubber (SCC 3-05-025-08)	0.019[f]	0.039[f]	g	g	g	g
Sand dryer with fabric filter (SCC 3-05-025-08)	0.0053[h]	0.010[h]	g	g	g	g
Sand handling, transfer, and storage with wet scrubber (SCC 3-05-025-R)	0.00064[j]	0.0013[j]	ND	ND	ND	ND
Sand screening with venturi scrubber (SCC 3-05-025-Q)	0.0042[k]	0.0083[k]	ND	ND	ND	ND

[a]Factors represent uncontrolled emissions unless noted. SCC = Source Classification Code. Dryer emission factors in units of kg/Mg and lb/ton of material dried; other factors in units of kg/Mg and lb/ton of material stored or screened.
[b]Filterable PM is that PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train.
[c]Reference 11. EMISSION FACTOR RATING: E.
[d]Reference 9.
[e]References 9,12.
[f]References 5,12. EMISSION FACTOR RATING: C.
[g]Control device has no effect on emissions. See factor for uncontrolled emissions.
[h]References 6,10.
[j]Reference 8. For dried sand.
[k]Reference 13. Screening of dried sand.

Draft Table 11.19.1-2 (Metric And English Units).
EMISSION FACTORS FOR INDUSTRIAL SAND AND GRAVEL PROCESSING–
ORGANIC POLLUTANTS[a]

EMISSION FACTOR RATING: D

Source	Pollutant		Emission factor	
	CASRN[b]	Name	kg/Mg	lb/ton
Diesel-fired sand dryer with fabric filter (SCC 3-05-025-p)	50-00-0	Formaldehyde	0.0021	0.0043
	206-44-0	Fluoranthene	3.0×10^{-6}	6.0×10^{-6}
	91-20-3	Naphthalene	2.9×10^{-5}	5.9×10^{-5}
	85-01-8	Phenanthrene	7.5×10^{-6}	1.5×10^{-5}

[a]Factors represent uncontrolled emissions unless noted. SCC = Source Classification Code. Dryer emission factors in units of kg/Mg and lb/ton of material dried. Reference 7.
[b]Chemical Abstract Service Registry Number.

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6. *Stack Test Report For Redi-Crete Corporation*, Trace Technologies, Inc. Bridgewater, NJ, December 19, 1988.

7. *P.W. Gillebrand Company, Toxic Emissions Testing, Specialty Sand Dryer*, BTC Environmental, Inc., Ventura, CA, November 8, 1991.

8. *U.S. Silica Company, Newport, New Jersey, Emission Compliance Test Program*, AirNova, Inc., Collingswood, NJ, April 1990.

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10. *Source Emissions Compliance Test Report, Number Two Sand Dryer, Jesse S. Morie & Son, Inc., Mauricetown, New Jersey*, Roy F. Weston, Inc., West Chester, PA, August 1987.

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12. *Compliance Stack Sampling Report for Richard Ricci Company, Port Norris, NJ*, Recon Systems, Inc., Three Bridges, NJ, July 31, 1987.

13. *Report to Badger Mining Corporation, Fairwater, Wisconsin, for Stack Emission Test, Particulate Matter, Sand Rescreening System, St. Marie Plant, April 7, 1987*, Environmental Technology & Engineering Corporation, Elm Grove, WI, June 17, 1987.

CONTACT REPORT--MRI Project No. 4602-01

From: Richard Marinshaw, Environmental Engineering Department

Date of Contact: November 9, 1994

Contacted by: Telephone

Company/Agency: New Jersey Dept. of Environmental Protection
Division of Environmental Quality
401 East State Street
Trenton, New Jersey 08625-0411

Telephone Number: (609) 530-4041

Person(s) Contacted/Title(s)

Fred Ballay, Principal Environmental Specialist

CONTACT SUMMARY:

Mr. Ballay was contacted for clarification of the source (APC ID No. 75013, NJ Stack No. 006) tested as documented in the April 1990 emission test report for the U.S. Silica facility in Newport, New Jersey. The source is identified in the test report as a group of sand storage silos.

Mr. Ballay stated that the test report documents emissions from the scrubber through which are ducted emissions from conveyor belts and an elevator that transfer sand from the dryers to storage silos. Therefore, the measurements represent emissions from dried sand handling and transfer.

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Mr. Ballay stated that the test report documents emissions from the scrubber through which are ducted emissions from conveyor belts and an elevator that transfer sand from the dryers to storage silos. Therefore, the measurements represent emissions from dried sand handling, transfer, and storage.

Source category : Sand and gravel — Date: 09/13/94
Plant name : Redi-Crete Corporation — Location: Flanders, NJ
Test date : 11/16/88 — Ref. No.: 7/
Process : sand drying, screening — Process rate basis: production
Filename : SAND_R07.WQ1

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen. ppm
Dryer/ shaker scre	cyclone/ baghouse	filt. PM	1	0.184	35.0	0.0026	0.0053		
		filt. PM	2	0.248	28.4	0.0044	0.0087		
		filt. PM	3	0.358	28.4	0.0063	0.013		
		AVERAGE				0.0044	0.0089	RATING:	B

Notes:
1. Also sampled for CO, TOC, and CO2, but not detected.
2. Both sources (rotary dryer and shaker screen) ducted to same stack.

Source category : Sand and gravel — Date: 09/13/94
Plant name : P. W. Gillebrand Company — Location: Simi Valley, CA
Test date : 11/8/91 — Ref. No.: 8/
Process : specialty sand — Process rate basis: unclear
Filename : SAND_R08.WQ1

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen. ppm
Dryer, diesel fired	FF	formaldehyde	1	0.195	59.0	0.0017	0.0033		
		formaldehyde	2	0.010	59.0	8.5E-05	0.00017		
		formaldehyde	3	0.549	59.0	0.0047	0.0093		
				AVERAGE		0.0021	0.0043	RATING:	B
		fluoranthene	1	0.00049	59.0	4.1E-06	8.3E-06		
		fluoranthene	2	0.00047	59.0	4.0E-06	8.0E-06		
		fluoranthene	3	0.00011	59.0	8.9E-07	1.8E-06		
				AVERAGE		3.0E-06	6.0E-06	RATING:	B
		naphthalene	1	0.00299	59.0	2.5E-05	5.1E-05		
		naphthalene	2	0.00511	59.0	4.3E-05	8.7E-05		
		naphthalene	3	0.00234	59.0	2.0E-05	4.0E-05		
				AVERAGE		2.9E-05	5.9E-05	RATING:	B
		phenanthrene	1	0.00123	59.0	1.0E-05	2.1E-05		
		phenanthrene	2	0.00131	59.0	1.1E-05	2.2E-05		
		phenanthrene	3	0.00011	59.0	8.9E-07	1.8E-06		
				AVERAGE		7.5E-06	1.5E-05	RATING:	B

Notes:
1. Pulse jet baghouse.
2. Also equipped with low-NOx burner.
3. Operating capacity of 100 ton/hr.
4. Run 3 below detection limit (DL) for fluoranthene and phenanthrene; half the DL used.
5. 13 other PAH's sampled below DL.
6. Formaldehyde by CARB Method 430; PAH's by CARB Method 429.

Source category : Sand and gravel — Date: 11/09/94
Plant name : U.S. Silica Company — Location: Newport, NJ
Test date : 3/8/90 — Ref. No.: 9/
Process : sand processing — Process rate basis: production
Filename : SAND_R09.WQ1

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen. ppm
Sand handling, transfer, and storage	wet scrubber	filt. PM	1	0.23	150	0.00077	0.0015		
		filt. PM	2	0.26	150	0.00087	0.0017		
		filt. PM	3	0.089	150	0.00030	0.00059		
		AVERAGE				0.00064	0.0013	RATING:	B

Notes:
1. Foundry sand.
2. Exhaust stream includes emissions from conveyor belts and elevator that transfer sand from the dryer to storage silos.
3. PM sampled using NJ Air Test Method 1.

Source category : Sand and gravel
Plant name : The Morie Company, Inc.
Test date : 11/22/89
Process : sand processing
Filename : SAND_R10.WQ1

Date: 09/13/94
Location: Mauricetown, NJ
Ref. No.: 10/
Process rate basis: feed / product

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Fluid bed dryer/ cooler (No. 2 fuel oil fired)	FF	NOx	1	2.6	90.0	0.014	0.029		
		NOx	2	2.8	89.0	0.016	0.031		
		NOx	3	2.9	88.0	0.016	0.033		
				AVERAGE		0.016	0.031	RATING:	B
		CO2	1	2,589	90.0	14	29	47,153	0.8
		CO2	2	1,911	89.0	11	21	46,397	0.6
		CO2	3	3,238	88.0	18	37	47,167	1.0
				AVERAGE		15	29	RATING:	B

Notes:
1. Industrial sand.
2. NOx by Method 7E; CO2 by Orsat.

Source category : Sand and gravel — Date: 09/13/94
Plant name : The Morie Company, Inc. — Location: Mauricetown, NJ
Test date : 11/22/89 — Ref. No.: 11/
Process : sand processing — Process rate basis: feed/production
Filename : SAND_R11.WQ1

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Fluid bed dryer/ cooler (No. 2 fuel oil fired)	FF	BASED ON FEED RATE							
		filt. PM	1	1.51	93.1	0.0081	0.016		
		filt. PM	2	1.42	92.7	0.0077	0.015		
		filt. PM	3	0.36	90.2	0.0020	0.0040		
		AVERAGE				0.0059	0.012	RATING:	A
		BASED ON PRODUCTION RATE							
		filt. PM	1	1.51	90.7	0.0083	0.017		
		filt. PM	2	1.42	90.3	0.0079	0.016		
		filt. PM	3	0.36	87.6	0.0021	0.0041		
		AVERAGE				0.0061	0.012	RATING:	A

Notes:
1. Industrial sand.
2. NOx by Method 7A; PM by NJAT Method 1.
3. Two dryers and a cooler in parallel.
4. NOx not detected.

Source category : Sand and gravel — Date: 09/13/94
Plant name : New Jersey Pulverizing Company — Location: Bagville, NJ
Test date : 11/19/87 — Ref. No.: 12/
Process : sand processing — Process rate basis: production
Filename : SAND_R12.WQ1

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Rotary dryer (Gas-fired)	none	filt. PM	1	58.99	31.3	0.94	1.9		
		filt. PM	2	59.73	31.3	0.96	1.9		
		filt. PM	3	65.79	31.3	1.1	2.1		
				AVERAGE		0.98	2.0	RATING:	C
	cyclone/ WS	filt. PM	1	7.99	31.3	0.13	0.26		
		filt. PM	2	5.59	31.3	0.089	0.18		
		filt. PM	3	7.14	31.3	0.11	0.23		
				AVERAGE		0.11	0.22	RATING:	C

Notes:
1. Industrial sand.
2. PM by NJAT Method 1.
3. Dryer has capacity of 31.25 ton/hr.
4. Report does not provide process rates but states that dryer was operated at permit condi Therefore, the process rates were assumed to equal production capacity.
5. Data rated C due to uncertainty of process rates.

Source category : Sand and gravel
Plant name : Ricci Brothers Sand Company
Test date : 7/14/87
Process : sand processing
Filename : SAND_R13.WQ1

Date: 09/13/94
Location: Port Norris, NJ
Ref. No.: 13/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Rotary dryer (No. 2 oil-fired)	cyclone/ WS	filt. PM	1	1.08	26.2	0.021	0.041		
		filt. PM	2	0.98	22.7	0.022	0.043		
		filt. PM	3	0.94	23.6	0.020	0.040		
				AVERAGE		0.021	0.041	RATING:	A
		CO2	1	672.67	26.2	13	26	4,900	2.0
		CO2	2	571.77	22.7	13	25	4,900	1.7
		CO2	3	571.77	23.6	12	24	4,900	1.7
				AVERAGE		13	25	RATING:	A

Notes:
1. Industrial sand.
2. PM by NJAT Method 1; CO2 by Orsat.
3. Dryer capacity: 25 ton/hr.

Source category : Sand and gravel
Plant name : Badger Mining Corporation
Test date : 4/7/87
Process : sand processing
Filename : SAND_R14.WQ1

Date: 09/13/94
Location: Fairwater, WI
Ref. No.: 14/
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
Sand rescreening	VS	filt. PM	1	0.20	20.0	0.0050	0.010		
		filt. PM	2	0.15	20.0	0.0038	0.0075		
		filt. PM	3	0.15	20.0	0.0038	0.0075		
				AVERAGE		0.0042	0.0083	RATING:	B

Notes:
1. Industrial sand.
2. PM by Method 17.