ATTACHMENT #3

Nonmetallic Mining Guidance
For The Development Of The 1998 Air Emissions Inventory

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Acknowledgments

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Further Information

If you require further guidance than what is supplied in this document contact your DNR air emission inventory person. DNR establishes one air emission inventory contact per facility in the state. If you do not know who your air contact is, call Ralph Patterson at 608-267-7546, for this information.

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Section 13-Stationary Source Emissions and Emission Factors

Nonmetallic mining air emissions can be generated by portable crushing equipment, stationary crushing equipment, or the quarry site. This section identifies the source of particulate matter, PM_{10}, nitrogen oxide, carbon monoxide, and reactive organic gas (also known as volatile organic compound) emissions. All four tables note which emissions are applicable according to the following legend. The emissions factors are applicable according to the following codes:

1. **Q** Quarry Site
2. **G** Gravel Pit Site
3. **S** Screening
4. **C** Crusher

Particulate Matter [1]

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Primary Crushing	30502001	C	0.00035 lb PM/ton of process throughput	0.000175 lb PM/ton of process throughput	0.000063 lb PM/ton of process throughput	
Crusher Fuel Use	20200102	C	42.4 lb PM/1000 gal #2 fuel oil	42.4 lb PM/1000 gal #2 fuel oil	42.4 lb PM/1000 gal #2 fuel	Refer to AP-42 Section 3.3, if other fuel burned
Loading Grizzly	30502013	S, C	0.000008 lb PM/ton of process throughput	0.000004 lb PM/ton of process throughput	0.00000144 lb PM/ton of process throughput	Insignificant Particulate Matter emission
Secondary Crushing	30502002	C	0.00252 lb PM/ton of process throughput	0.00126 lb PM/ton of process throughput	0.001239 lb PM/ton of process throughput	Has wet suppression emission factor
Tertiary Crushing	30502003	C	0.00252 lb PM/ton of process throughput	0.00126 lb PM/ton of process throughput	0.001239 lb PM/ton of process throughput	Has wet suppression emission factor
Fines Crushing	30502005	C	0.01575 lb PM/ton of process throughput	0.007875 lb PM/ton of process throughput	0.0042 lb PM/ton of process throughput	Has wet suppression emission factor
Screening (with the exception of fines screening)	30502004, 30502013, 30502014, 30502015, 30502016	S, C	0.01575 lb PM/ton of process throughput	0.007875 lb PM/ton of process throughput	0.001764 lb PM/ton of process throughput	Has wet suppression emission factor
Fines Screening	30502021	S, C	0.07455 lb PM/ton of process throughput	0.037275 lb PM/ton of process throughput	0.00441 lb PM/ton of process throughput	Has wet suppression emission factor
Conveying Transfer Points	30502006	S, C	0.00147 lb PM//ton of process throughput	0.000735 lb PM/ton of process throughput	0.0001004 lb PM/ton of process throughput	Has wet suppression emission factor
Blasting	30502009	Q, C	None	None	None	
Drilling	30502010	Q, C	0.000084 lb PM/ton of process throughput	0.000042 lb PM/ton of process throughput	0.00001512 lb PM/ton of process throughput	Insignificant Particulate Matter Emission

1 The PM emission factors were developed from Section 11.19.2 of the January, 1995 version of AP-42.

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Drilling fuel use	20200301, 20200102	Q, C	42.4 lb PM/ 1000 gal #2 fuel oil	42.4 lb PM/1000 gal #2 fuel oil	42.4 lb PM/1000 gal #2 fuel oil	Refer to AP-42 Section 3.3 if other fuel used
Truck loading by conveyor	30502032	Q, C	0.000105 lb PM/ton of rock loaded	0.0000525 lb PM/ton of rock loaded	0.0000189 lb PM/ton of rock loaded	Insignificant Particulate Matter Emission
Truck unloading: fragmented stone	30502031	Q, C	0.0000168 lb PM/ton of rock unloaded	0.0000084 lb PM/ton of rock unloaded	0.000003024 lb PM/ton of rock unloaded	Insignificant Particulate Matter Emission
Hauling to crusher using loader-unpaved haul roads	30502011	C	2.6185 lb PM/ vehicle mile travelled or 0.01376 lb PM/ton of process throughput	0.8788 lb PM/ vehicle miles travelled or 0.0046 lb PM/ton of process throughput	0.02357 lb PM/ vehicle miles travelled or 0.0012 lb PM/ton of process throughput	Default values valid only for back and forth trip length at or below 0.047 mile (250 feet). For trip length greater than 0.047 mile(250 feet) multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Hauling to crusher using loader-paved haul roads	30502037	C	0.8367 lb PM/ vehicle mile travelled or 0.00437 lb PM/ton of process throughput	0.4184 lb PM/ vehicle miles travelled or 0.002185 lb PM/ton of process throughput	0.1506 lb PM/ vehicle miles travelled or 0.000787 lb PM/ton of process throughput	Default values valid only for back and forth trip length at or below 0.047 mile (250 feet). For trip length greater than 0.047 mile(250 feet) multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Haul truck traffic on unpaved haul roads	30502033 (SCC proposed)	Q, G, C	4.695 lb PM/ vehicle mile travelled or 0.247 lb PM/ton of process throughput	1.576 lb PM/ vehicle mile travelled or 0.083 lb PM/ton of process throughput	0.423 lb PM/vehicle mile travelled or 0.0223 lb PM/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Haul truck traffic on paved haul roads	30502034 (SCC proposed)	Q, G, C	2.25 lb PM/vehicle miles travelled or 0.1184 PM/ton of process throughput	1.125 lb PM/vehicle miles travelled or 0.0592 lb PM/ton of process throughput	0.405 lb PM/vehicle miles travelled or 0.00213 lb PM/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Mine truck traffic on unpaved haul roads	30502035 (SCC proposed)	Q, G, C	8.474 lb PM/vehicle miles travelled or 0.1599 lb PM/ton of process throughput	2.844 lb PM/vehicle miles travelled or 0.054 lb PM/ton of process throughput	0.763 lb PM/vehicle miles travelled or 0.0144 lb PM/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Stockpiles fed by unloading trucks	30502007	Q, G, C	0.0074 lb PM/ton of process throughput	0.0037 lb PM/ton of process throughput	0.0015 lb PM/ton of process throughput	
Stockpile operations for stockpiles fed by conveyors	30502042 (SCC proposed)	Q, G, C	0.003681 lb PM/ton of process throughput	0.00184 lb PM/ton of process throughput	0.000663 lb PM/ton of process throughput	Has a wet suppression emission factor
Stockpile wind erosion	30502043 (SCC proposed)	Q, G, C	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible.	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible..	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible.	If there are no visible emissions, then emissions are insignificant.
Overburden removal	30502051 (SCC proposed)	Q, G, C	Same as Haul truck traffic on upaved haul roads unless best management practices applied	Same as Haul truck traffic on unpaved haul roads unless best management practices applied	Same as Haul truck traffic on unpaved haul roads unless best management practices applied	Emissions are insignificant when best management practices are used.

PM_{10} Emissions [1]

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Primary Crushing	30502001	C	0.00035 lb PM_{10}/ton of process throughput	0.000175 lb PM_{10}/ton of process throughput	0.000063 lb PM_{10}/ton of process throughput	
Crusher Fuel Use	20200102	C	42.4 lb PM_{10}/1000 gal #2 fuel oil	42.4 lb PM_{10}/1000 gal #2 fuel oil	42.4 lb PM_{10}/1000 gal #2 fuel	Refer to AP-42 Section 3.3 if other fuel burned
Loading Grizzly	30502013	S, C	0.000008 lb PM_{10}/ton of process throughput	0.000004 lb PM_{10}/ton of process throughput	0.00000144 lb PM_{10}/ton of process throughput	Insignificant Particulate Matter Emission
Secondary Crushing	30502002	C	0.0012 lb PM_{10}/ton of process throughput	0.0006 lb PM_{10}/ton of process throughput	0.00059 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Tertiary Crushing	30502003	C	0.0012 lb PM_{10}/ton of process throughput	0.0006 lb PM_{10}/ton of process throughput	0.00059 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Fines Crushing	30502005	C	0.0075 lb PM_{10}/ton of process throughput	0.00375 lb PM_{10}/ton of process throughput	0.0020 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Screening (with the exception of fines screening)	30502004, 30502014, 30502015, 30502016	S, C	0.0075 lb PM_{10}/ton of process throughput	0.00375 lb PM_{10}/ton of process throughput	0.00084 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Fines Screening	30502021	S, C	0.0355 lb PM_{10}/ton of process throughput	0.01775 lb PM_{10}/ton of process throughput	0.0021 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Conveying Transfer Points	30502006	S, C	0.0007 lb PM_{10}/ton of process throughput	0.00035 lb PM/ton of process throughput	0.000048 lb PM_{10}/ton of process throughput	Has wet suppression emission factor
Blasting	30502009	Q, C	None	None	None	
Drilling	30502010	Q, C	0.00004 lb PM_{10}/ton of process throughput	0.00002 lb PM_{10}/ton of process throughput	0.0000072 lb PM_{10}/ton of process throughput	Insignificant Particulate Matter Emission
Drilling fuel use	20200301, 20200102	Q, C	42.4 lb PM_{10}/ 1000 gal #2 fuel oil	42.4 lb PM_{10}/1000 gal #2 fuel oil	42.4 lb PM_{10}/1000 gal #2 fuel oil	Refer to AP-42 Section 3.3 if other fuel burned

[1]The PM_{10} emission factors were developed from Section 11.19.2 of the January, 1995 version of AP-42.

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Truck loading by conveyor	30502032	Q, C	0.00005 lb PM_{10}/ton of rock loaded	0.000025 lb PM_{10}/ton of rock loaded	0.000009 lb PM_{10}/ton of rock loaded	Insignificant Particulate Matter Emission
Truck unloading: fragmented stone	30502031	Q, C	0.000008 lb PM_{10}/ton of rock unloaded	0.000004 lb PM_{10}/ton of rock unloaded	0.00000144 lb PM_{10}/ton of rock unloaded	Insignificant Particulate Matter Emission
Hauling to crusher using loader-unpaved haul roads	30502011	C	0.9425 lb PM_{10}/ vehicle mile travelled or 0.00495 lb PM_{10}/ton of process throughput	0.3160 lb PM_{10}/ vehicle mile travelled or 0.00166 lb PM_{10}/ton of process throughput	0.0848 lb PM_{10}/ vehicle mile travelled or 0.00045 lb PM_{10}/ton of process throughput	Default values valid only for back and forth trip length at or below 0.047 mile (250 feet). For trip length greater than 0.047 mile(250 feet) multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Hauling to crusher using loader-paved haul roads	30502037	C	0.1633 lb PM_{10}/ vehicle mile travelled or 0.0009 lb PM_{10}/ton of process throughput	0.0816 lb PM_{10}/ vehicle mile travelled or 0.0004 lb PM_{10}/ton of process throughput	0.0294 lb PM_{10}/ vehicle mile travelled or 0.0002 lb PM_{10}/ton of process throughput	Default values valid only for back and forth trip length at or below 0.047 mile (250 feet). For trip length greater than 0.047 mile(250 feet) multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Haul truck traffic on unpaved haul roads	30502033 (SCC proposed)	Q, G, C	1.692 lb PM_{10}/ vehicle mile travelled or 0.089 lb PM_{10}/ton of process throughput	0.568 lb PM_{10}/ vehicle mile travelled or 0.0299 lb PM_{10}/ton of process throughput	0.152 lb PM_{10}/ vehicle mile travelled or 0.008 lb PM_{10}/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Haul truck traffic on paved haul roads	30502034 (SCC proposed)	Q, G, C	0.439 lb PM_{10}/ vehicle mile travelled or 0.0231 lb PM_{10}/ton of process throughput	0.219 lb PM_{10}/ vehicle mile travelled or 0.0115 lb PM_{10}/ton of process throughput	0.079 lb PM_{10}/ vehicle mile travelled or 0.0042 lb PM_{10}/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Mine truck traffic on unpaved haul roads	30502035 (SCC proposed)	Q, G, C	3.05 lb PM_{10}/ vehicle mile travelled or 0.058 lb PM_{10}/ton of process throughput	1.024 lb PM_{10}/ vehicle mile travelled or 0.0193 lb PM_{10}/ton of process throughput	0.2745 lb PM_{10}/ vehicle mile travelled or 0.00518 lb PM_{10}/ton of process throughput	Default values valid only for back and forth trip length at or below 1 mile. For trip length greater than 1 mile multiply the default factor by the trip length or calculate emission based on equation 13.2.2(1) in AP-42.
Stockpiles fed by unloading trucks	30502007	Q, G, C	0.00174 lb PM_{10}/ton of process throughput	0.00087 lb PM_{10}/ton of process throughput	0.000313 lb PM_{10}/ton of process throughput	
Stockpile operations for stockpiles fed by conveyors	30502042 (SCC proposed)	Q, G, C	0.0024 lb PM_{10}/ton of process throughput	0.0012 lb PM_{10}/ton of process throughput	0.0004 lb PM_{10}/ton of process throughput	Has a wet suppression emission factor

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Stockpile wind erosion	30502043 (SCC proposed)	Q, G, C	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible.	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible.	Calculate emissions using equations in Section 13.2.4 of AP-42 when emissions are visible.	If there are no visible emissions, then emissions are insignificant.
Overburden removal	30502051 (SCC proposed)	Q, G, C	Same as Haul truck traffic on upaved haul roads unless best management practices applied	Same as Haul truck traffic on unpaved haul roads unless best management practices applied	Same as Haul truck traffic on unpaved haul roads unless best management practices applied	Emissions are insignificant when best management practices are used.

SO2, NOx, CO, ROG emissions [1]

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	SO2 Emission Factor	NOx emission factor	CO emission factor	ROG emission factor
Primary Crushing	30502001	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Crusher Fuel Use	20200301, 20200102	C	39.7 lb SO2/1000 gal #2 fuel oil	604 lb NOx/1000 gal #2 fuel oil	130 lb CO/1000 gal #2 fuel	49.3 lb ROG/1000 gal #2 fuel
Loading Grizzly	30502013	S, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Secondary Crushing	30502002	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Tertiary Crushing	30502003	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fines Crushing	30502005	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Screening (with the exception of fines screening)	30502004, 30502013, 30502014, 30502015, 30502016	S, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fines Screening	30502021	S, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Conveying Transfer Points	30502008	S, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Blasting	30502009	Q, C	2 lb SO2/ton ANFO (only needs to be reported by the blaster after specific request from DNR)	17 lb NOx/ton ANFO (only needs to be reported by the blasterafter specific request from DNR)	67 lb CO/ton ANFO (only needs to be reported by the blasterafter specific request from DNR)	None
Drilling	30502010	Q, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Drilling fuel use	20200301, 20200102	Q, C	39.7 lb SO2/ 1000 gal #2 fuel oil	604 lb NOx/1000 gal #2 fuel oil	130 lb CO/1000 gal #2 fuel oil	49.3 lb ROG/1000 gal #2 fuel oil
Truck loading by conveyor	30502032	Q, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1]Fuel use emission factors developed from Section 3.3 of the January, 1995 version of AP-42. Blasting emission factors developed from Section 13.3.1 of the January, 1995 version of AP-42.

Process Name	SCC	Quarry Site (Q), Gravel Pit (G) Screening Operation (S) Crusher (C)	Resulting Default Emission Factor at 50% control	Resulting Default Emission Factor at 75% control	Resulting Default Emission Factor at greater than 90% control	Comments
Truck unloading: fragmented stone	30502031	Q, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hauling to crusher using loader-unpaved roads	30502011	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hauling to crusher using loader-paved roads	30502037	C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Haul truck traffic on unpaved haul roads	30502033 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Haul truck traffic on paved haul roads	30502034 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mine truck traffic on unpaved haul roads	30502035 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Stockpiles fed by unloading trucks	30502007	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Stockpile operations for stockpiles fed by conveyors	30502042 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Stockpile wind erosion	30502043 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Overburden removal	30502051 (SCC proposed)	Q, G, C	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Appendix G

Tier Control Requirements

Tier Control Requirements[a]

Process	50% Control[b] Dry Factors	75% Control Dry Factors	greater than 90% Control[c] Wet Factors
Screening, Primary Crushing, Secondary Crushing, Tertiary Crushing Fines Crushing, loading grizzly,	Document yearly throughput.	1. Document yearly throughput. 2. Document daily suppression activities and/or meteorological conditions.[d] 3. On-site Fugitive Dust Observer located with crushing spread during hours that crushing spread operates.	1. Document yearly throughput. 2. Document daily suppression activities and/or meteorological conditions.[d] 3. On-site Fugitive Dust Observer located at crushing site during hours that crushing spread operates. 4. At least one Visible Emission Reader on staff. 5. Document visible emissions at or below 10% once per 8 hour shift at site.
Conveyor Transfer Points	1. Document yearly throughput. 2. Minimize drop height.	1. Document yearly throughput. 2. Document daily suppression activities and/or meteorological conditions. [d] 3. Maintain suppressive equipment in operating condition. 4. On-site Fugitive Dust Observer located with crushing spread during hours that crusher spread operates.	1. Document yearly throughput. 2. Document daily suppression activities and/or meteorological conditions.[d] 3. On-site Fugitive Dust Observer located at crushing site during hours that crushing spread operates. 4. At least one Visible Emission Reader on staff. 5. Document visible emissions at or below 10% once per 8 hour shift at site.
Haul to crusher using loader, haul truck traffic on unpaved haul roads, mine truck traffic on unpaved haul roads, stockpiles fed by unloading trucks	1. Document yearly throughput. 2. Speed control.	1. Document yearly throughput. 2. Record of: water truck use, street sweeper use, use of alternate dust control measures (e.g. use of recycled pavement, asphalt tack coat), and/or documentation of meteorological conditions.[d] 3. On-site Fugitive Dust Observer located at crushing spread during hours that crusher spread operates. 4. Speed control implemented at crushing site.	1. Document yearly throughput. 2. Document daily suppression activities and/or meteorological conditions.[d] 3. On-site Fugitive Dust Observer located at crushing site during hours that crushing spread operates. 4. At least one Visible Emission Reader on staff. 5. Document visible emissions at or below 10% once per 8 hour shift at site. 6. Speed control implemented at crushing site.

*Footnotes from **Tier Control Requirements Table**:*

a. This table is not applicable for blasting, drilling, fuel use, truck loading by conveyor, truck unloading of fragmented stone, stockpile operations for stockpiles fed by conveyors, stockpile wind erosion, and overburden removal.

b. DNR recognizes that moisture inherent to climatic conditions prent in Wisconsin would allow for some control beyond the "bone dry" test numbers produced for AP-42. An estimation of 50% control is applied to these wet numbers.

c. To be eligible for greater than 90% control, the crushing plant must be equipped with spraybars and these spraybars must be used wen needed to maintain dust emissions within allowable limits.

d. Companies need to Companies need to keep records on-site regarding precipitation to be eligible for the 75% or greater than 90% control tier. Producers should add the following information to their on-site production sheets to address this requirement:

Type of Suppression	***Water***
(spray bars, climatic, etc.)	Water In Aggregate_____(check if applicable) or
	Precipitation _____ (check if applicable) or
	Added water _____ (supply quantity per time)