Comment on the Draft Environmental Impact Statement
For the Millenium Bulk Terminals — Longview

by Michael Riordan, Ph.D.

This document is my official comment on the SEPA Draft Environmental Impact Statement for the Millennium Bulk Terminals — Longview (MBTL) project, which was released for public comment on April 29, 2016. During the past four years, I have been submitting scoping and other comments on this and other proposed coal-terminal projects in the Pacific Northwest, namely the Gateway Pacific Terminal at Cherry Point, WA, and the Coyote Island project near Boardman, OR. In all three projects, I have focused on the fugitive coal-dust releases at the terminals, especially into the adjacent waters, and have developed considerable expertise in this area. For an example of this work, please consult my analysis of coal-dust losses into Salish Sea waters near Cherry Point from the planned Gateway Pacific Terminal (GPT).[1] I will restrict my comments herein to similar aspects of the MBTL SEPA Draft Environmental Impact Statement (DEIS), particularly those presented in Section 5.7: Coal Dust.

To summarize, the MBTL DEIS severely underestimates the amount of fugitive coal-dust losses into the surrounding environments, both on land in Longview and into the adjacent Columbia River. The principal reasons for these underestimates include the use of unwarranted, optimistic input parameters in the AP-42 fugitive dust calculations (specified by the Environmental Protection Agency), and the application of unjustified and unreasonably high efficiency factors for dust-control measures (such as watering) proposed to be used at the terminal. In general, I find that the figures for fugitive-dust emission rates presented in the DEIS to be low by factors of 2 to 7. This means that the values provided in Table 5.7-2. Coal Dust Total Suspended Particulates Emissions Rates at Maximum Throughput (DEIS p. 5.7-5) should be multiplied by factors of 2 to 7 to be truly representative of emissions that would occur at the proposed MBTL facility.

The assumption of a 95 percent fugitive-dust reduction efficiency two paragraphs below that table is unwarranted. This figure was imported from a previous analysis of the

[1] Michael Riordan, "Estimating Fugitive Coal Dust at the Proposed Gateway Pacific Terminal," Eastsound, WA: Research Now Working Paper No. 16-1, January 26, 2016, available online at *http://www.research-now.org/wp-content/uploads/2016/01/FugitiveDustAtGPT.pdf*

proposed Boardman project and has no basis in actual experience. Moreover, the Coyote Island terminal proposed for that site was a completely enclosed coal-storage-and-transfer system — unlike MBTL, which is proposed to employ open coal-storage piles. Adequate justification is not given for the 95 percent figure used in the MBTL DEIS. If one instead applied an equally reasonable 90 percent in this calculation, given the limited justification for the other figure, the estimated fugitive coal-dust losses from the corresponding part of the transfer system would double. If the 95 percent efficiency factor is to be used in this calculation, it requires much better justification than has been provided in the DEIS.

I could not find specific details of the AP-42 calculations, including important parameters such as average local wind speeds at the terminal and coal moisture and silt content, in the DEIS proper. In the SEPA Coal Technical Report (listed as document No. ICF 00264.13, April 2016), I did find a Table 2 on p. 12 that is identical to Table 5.7-2 mentioned above, below the statement:

> The potential for coal dust emission from the coal export terminal and impacts on the area surrounding the coal terminal were estimated using AERMOD Version 14134. . . . AERMOD estimates the deposition of particulates (such as coal dust) using information on the particulates' emission rate and particle sizes.[2]

On the very next page, this document states that procedures from EPA AP-42, Sections 13.2.4 and 13.2.5 were used to estimate emissions rates, and that further details on the air-quality modeling could be found in a 2015 report prepared by the URS Corporation.[3] The needed details of the AP-42 calculations, which are crucial inputs to the AERMOD simulations of coal-dust dispersal, were finally found in Appendices C through G of this report — which was not on the MBTL web site (as it should have been), and I obtained only after great difficulty from one of the three co-lead agencies. Numbers presented in Appendix C: Summary of Emissions of this report correspond exactly to those given in Table 5.7-2 of the DEIS and Table 2 of the SEPA Coal Quality Technical Report, so it is safe to conclude that these appendices represent the calculations of the coal-dust emission rates used in the AERMOD simulations extensively quoted in the DEIS. It was surprising — and somewhat disturbing — that this information is not publicly available on the web.

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[2] Millennium Bulk Terminals—Longview, SEPA Coal Technical Report, April 2016, p. 12.

[3] Millennium Coal Export Terminal, Longview, Washington, Environmental Report, Air Quality (URS Corporation 2015).

Appendix C states at the outset that the maximum throughput for this project will be 49 million tons of coal per year, based on 8 trains per day each consisting of 125 rail cars containing 100 tons per car unloading coal 355 days a year. But these figures yield only 100,000 tons per day or 35.5 million tons per year, well short of the projected annual total. Something is seriously amiss with these figures, probably the coal tonnage per car, for if one were instead to use 125 tons/car, the total annual throughput comes in close to 49 million tons per year. This obvious error may however have been propagated through the calculations of fugitive dust emanating from the trains bringing coal to the terminal.

Appendix E uses a simplified approximation to obtain the fugitive coal dust from wind erosion of the storage piles, similar to the approach used in my report, "Estimating Fugitive Coal Dust at the Gateway Pacific Terminal."[4] A crucial input parameter in this approximation is the silt content of the coal, which the URS Corporation report cites as 2.2 percent, based on the mean value given in AP-42, Section 13.2.4, Table 13.2.4-1 for the coal used in "coal-fired power plants (as received)." But this value is not appropriate because that category of dust sources includes coal from many different mines within the US and shipped to electrical utilities located mainly east of the Mississippi. That sample necessarily includes lots of eastern bituminous coal, while the coal to be transported to the Longview terminal would all be western subbituminous coal from the Powder River Basin in Montana and Wyoming. The latter is generally much dustier and becomes even more so because it also dries out during open rail-car transport for more than 1,000 miles through one of the most arid regions of the country.[5] A more suitable number for the coal silt content to be inserted in this approximation is the mean value 6.2 percent for "western surface coal mining" in the same Table 13.2.4-1. And it could be dustier. AP-42 Section 11.9: Western Surface Coal Mining gives a mean value 8.6 percent in Table 11.9.3 for the silt content of western coal, based on a range of measured values from 6.0 to 11.3 percent — much greater than the 2.2 percent used by URS Corporation in its estimates.

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[4] Riordan (2016), p. 8. This approach is based on C. Cowherd, G. E. Muleski, and J. S. Kinsey, "Control of Open Fugitive Dust Sources: Final Report," Midwest Research Institute Report No. EPA-450/3-88-008, Kansas City, MO, September 1988. See especially section 4.0: Storage Piles, pp. 4-1 to 4-24, and eqn. 4-9, p. 4-17. The URS Corporation report cites the Western Regional Air Partnership Fugitive Dust Handbook, Section 9.3, as the source of this approximation, which is derived from the EPA report.

[5] See, for example, Roderick J. Hossfeld and Rod Hatt, "PRB Coal Degradation — Causes and Cures." Available online at *http://krtcommodities.com/files/PRB%20PRB%20COAL%20DEGRADATION.pdf.*

Replacing 2.2 percent by 6.2 percent in the equation, and applying the same 90 percent efficiency factor for wetting down the coal storage piles, one obtains total annual emissions from storage-pile erosion that are *nearly three times as large* as those in DEIS Table 5.7-2, or total suspended particulates (TSP) of 3.05 tons/year rather than 1.08.[6] (In the same vein, the PM10 emissions should come in at 2.59 tons/year rather than 0.92, and the PM2.5 emissions at 0.40 tons per year rather than 0.19.) And given such an extreme uncertainty in the silt content used in these very rough estimates, the uncertainties in the estimated particulate emissions rates should be taken as the difference between the two calculations — 1.97 tons/yr for TSP (and 1.67 and 0.21 tons/yr for PM10 and PM2.5.)

A much better approach to estimating these fugitive dust emissions would be to have made *actual measurements* of the silt content of the PRB coal being exported from the Westshore Terminals in Delta, British Columbia. These exports have been occurring throughout the period of the URS Corporation study and are continuing today. Given the major uncertainties in the estimated emissions due to the uncertainty in the silt content, it seems mandatory for the terminal proposers to make such measurements and then repeat these calculations (and AERMOD dust-dispersion modeling) using more accurate values obtained from such measurements of PRB coal similar to that to be exported by MBTL.

Appendix F addresses another major source of fugitive coal-dust emissions at MBTL, those that occur when coal is added to or extracted from the storage piles by the huge "stacker/reclaimer" mechanisms. According to AP-42 Section 13.2.4: Aggregate Handling and Storage Piles, the quantity of dust emissions is proportional to the average annual local wind speed U to the 1.3 power, or $U^{1.3}$, and inversely proportional to the coal moisture content M to the 1.4 power, or $M^{1.4}$. This part of the calculation appears to have been done properly, using appropriate values for U = 5.04 mph and M = 4.5 percent. But the report authors then apply two multiplicative efficiency factors to correct the emissions for wetting of the coal by sprayers and foggers: the same 90 percent efficiency factor as applied to the coal storage piles, and another factor of (1 - 175/365) = 0.52 derived from AP-42 Section 13.2.2: Unpaved Roads. The first correction factor is extremely dubious

6 But note that wetting down coal storage piles is not a very effective strategy for reducing dust emissions, especially when they are being frequently altered as in this case. As the EPA's AP-42 Section 13.2.4 states on p. 13.2.4-5, "Watering of the storage piles themselves has only a very temporary slight effect on total emissions. Thus the 90 percent efficiency factor applied in this calculation is likely to be excessive.

and the second completely inadmissible because it duplicates the effect of the first factor, and it applies to suppressing dust from *unpaved roads* — which is very different from the dust caused by falling coal. That is double counting. But taken together, as done in the URS Corporation calculations, they result in an excessive 95 percent reduction in the estimated emissions rate due to these coal-handling processes. Instead of 50.4 tons/per year TSP, for example, they obtain only 2.62 tons/year, the exact figure that appears in line 2 of DEIS Table 5.7-2, "Coal pile development and removal."

A much better way to estimate these emissions would be to use an appropriately higher value of the moisture content M in the AP-42 calculations to reflect the moisture added to the coal being transferred to and from the storage piles. If the moisture content were to be doubled to 9.0 percent, for example, the quantity of fugitive dust emissions generated in the materials-handling processes would decrease by 62.1 percent from 50.4 to 19.1 tons per year.[7] Or if M were to be tripled to 13.5 percent, the emissions would fall by 78.5 percent to 10.8 tons per year. But under no circumstances can anyone reasonably obtain an emissions rate reduction of 95 percent in these materials-handling processes by wetting the coal being handled, because coal dries out rapidly after wetting. The approach used by URS Corporation is *wrong*, pure and simple, leading to estimated values of coal particulate emissions rate that is too low by a factor of 4 to 7. Unfortunately, these errors are then propagated throughout the AERMOD dust-dispersion calculations to achieve results completely at odds with reality.

Appendix F also attempts to estimate the fugitive coal-dust emission rate from all other materials-handling operations, including the loading of the coal onto bulk carriers at the MBTL piers, and it reports a total TSP figure of 1.05 tons per year. This is exactly 20 percent, or one fifth of the 5.25 tons/year entered in Table 5.7-2, which leads me to think that a more conservative efficiency factor was used to obtain the latter result. Indeed, if one were to substitute an overall dust-containment efficiency factor of 95 percent for the 99 percent used for this calculation (i.e., one multiples the uncorrected emissions by 0.05 rather than 0.01), one obtains the necessary factor of 5 increase. That must be what was

[7] The appropriate domain of definition for these AP-42 calculations ranges up to a moisture content M of 4.8 percent. At higher levels, the accuracy of the calculations deteriorates and the uncertainty of the results increases. See EPA AP-42 Section 13.2.4: Aggregate Handling and Storage Piles, table on p. 13.2.4-4.

meant by the statement given on DEIS p. 5.7-5, "The modeling was completed for the deposition of coal particles and a more conservative assumption about the effectiveness of full enclosures and spray/fogging for conveyors. A 95% reduction was assumed for the enclosed conveyors and spray/fogging systems. . . ."[8] But a closer examination of these calculations reveals that an additional multiplicative factor of 0.52 has been applied to the uncorrected emissions, as it was to materials handling at the storage piles, based on AP-42 Section 13.2.2: Unpaved Roads. As before, this additional factor is duplicative and inadmissible. Thus the entry in Table 5.7-2, line 3, for "Ship transfer and conveyors," must be divided by 0.52 to remove the effects of this factor, resulting in a more credible value of 10.1 tons/year for these materials-handling emissions, not 5.25 tons/yr.

This approach is however inappropriate for calculations of emissions at the rail-car unloading facility and during loading of the bulk carriers at the piers, which are very different operations from those that occur inside the enclosed coal conveyors to and from the storage piles. During ship loading, for example, it is more appropriate to use equation (1) in AP-42 Section 13.2.4 (as was done for the storage-pile operations in Appendix F), which is the approach used to estimate to estimate such fugitive coal-dust emissions in the Coyote Island and Gateway Pacific Terminal projects.[9] Doing so, one readily obtains uncontrolled emissions during ship loading of 25.2 tons/year. Of course, some reduction of these emissions will occur due to the fact that ship-loading chutes would extend down into the carrier holds during loading, especially when the loading begins and the holds are largely empty. But winds blowing over the holds, which all have to remain open during the loading process, pulls out much of the dust drifting within them due to the Bernoulli effect. And coal is accidentally dropped onto the deck as a chute moves between holds; this coal is directly exposed to these winds.[10] Thus it is unreasonable to expect any better than a 50 percent reduction, which results in fugitive dust emissions during ship loading of 12.6 tons/year — much greater than the 5.25 tons/year given in DEIS Table 5.7-2 for the entire chain of materials-handling processes but comparable to the 10.1 tons/yr above.

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[8] The exact same statement appears in the SEPA Coal Technical Report, p. 13.

[9] ENVIRON International Corporation, "Gateway Pacific Terminal Air Quality Technical Report, Revised Site Layout," June 16, 2014, *http://eisgatewaypacificwa.gov/sites/default/files/content/files/AQ-GPT_RevisedLayout_AQ_Report_061614.pdf/.*

[10] See, for example, Riordan (2016), p. 13.

Appendix G attempts to estimate rates of fugitive dust emissions from coal trains approaching the MBTL site and waiting in line to be unloaded at the facility. This is a subject area beyond my specific expertise that would be better examined by experts like University of Washington Professor Dan Jaffe, who has researched this question in great detail.[11] But a brief examination of these calculations reveals that they are based on the same rough approximation URS Corp. used in Appendix E to estimate fugitive emissions from wind erosion of coal storage piles. This is an *exceedingly crude approximation* that is likely to be rife with major errors and large uncertainties, because this approach was intended to be used for storage piles, not trains. For example, URS Corporation again employs the same low value 2.2 percent for the coal silt content and provides no logical basis for it. Highly appropriate measurements of the silt content on the surface of trains carrying PRB coal passing near Longview after traversing the Columba Gorge *could* easily have been made, but they were not. Instead these estimates rely on a conveniently low value taken from AP-42 Table 13.2.4-1 for coal from mines throughout the United States. And such measurements *could* have evaluated the impact of topper agents called "surfactants" that are supposedly being administered by BNSF Railways to suppress the coal-dust emissions in transit. In addition, these calculations do not attempt to evaluate the percentage of time that the vector sum of the wind speed and train motion, called the "effective wind speed," exceeds the 12 mph threshold value for dust emission to occur — a necessary component of this approximation procedure.[12] The authors evaluate only the percentage of time annually (8.78%) that the ambient wind speed exceeds 12 mph, but that is not sufficient for this purpose. In the summer, for example, winds above 6.7 mph blow from the ENE about 26 percent of the time, in roughly the opposite direction from trains approaching and entering the MBTL site.[13] The effective wind speed at the coal surface will easily exceed the 12 mph threshold if the trains are traveling at only 10 mph.

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[11] See, for example, Daniel Jaffe *et al.,* "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," *Atmospheric Pollution Research* **6** (2015), pp. 946-952, available at *http://www.atmos.washington.edu/jaffegroup/modules/APOLLO/Jaffe_DPM_coal_dust_trains_ColumbiaRivGorge_2015.pdf*

[12] Cowherd et al. (1988), pp. 4-16 to 4-18. This dependence of fugitive emissions on the vector sum of the wind velocity and train velocity was also examined in Jaffe et al (2105). See especially Figure 4 on p. 951.

[13] Millennium Coal Export Terminal, Longview, Washington, Environmental Report, Air Quality Analysis Appendix L – Air Quality Modeling Analysis, URS Corporation, October 2014, revised January 2015. Figure 6: Wind Rose for the Mint Farm Station – Summer, p. 23.

For these and other reasons, the extremely rough approximation presented in Appendix G is completely inadequate in attempting to establish the total fugitive dust emissions from coal trains entering the MBTL site and awaiting unloading. This estimate needs to be repeated using a much better (computer) model of these emissions and more accurate values for crucial input parameters like the coal silt content and effective wind speeds over the loaded rail cars. For the purposes of further analysis, I will thus use a figure of 2.73 tons/year from this emission source, or three times the value quoted in DEIS Table 5.7-2, with an uncertainty of 1.82 tons/year — or two times that figure.

In conclusion, the values for fugitive coal-dust emission rates given in the MBTL SEPA Draft Environmental Impact Statement are based on unwarranted assumptions and optimistic input parameters for which little or no logical basis has been presented, either in this document or the supporting report by URS Corporation. The authors of that report appear to have cherry-picked data from the Environmental Protection Agency's AP-42 documents and applied these values inappropriately, in some cases using extremely high efficiency factors that are not and cannot be justified. They assume nearly perfect coal-terminal operations and allow no margin for human error. In an attempt to rectify these unwarranted assumptions and input parameters, I have come up with the following table to replace Table 5.7-2: Coal Dust Total Suspended Particulates at Maximum Throughput:

Operation	**Annual Average TSP Emission Rate, in tons/year**	
Coal pile wind erosion	3.05 – 5.02	(1.08)
Coal pile development and removal	10.8 – 19.1	(2.62)
Ship transfer and conveyors	10.1 – 12.6	(5.25)
From trains during unloading	2.73 – 4.55	(0.91)
Total	**26.7 – 46.3**	**(9.86)**

The individual rates presented in this table range from 1.9 to 7.3 times the values given in DEIS Table 5.7-2 (shown above in parenthesis), indicating how inaccurate those values in fact are, and the total of the four contributions falls between 2.7 to 4.7 times as high. In addition, the DEIS includes no estimate whatsoever for the fugitive-dust emissions that would occur during the process of unloading the rail cars and injecting the unloaded coal into the material stream entering terminal operations. This is a flagrant omission.

The fugitive coal-dust emissions rates for PM10 and PM2.5 particulates given in report Appendices C through G (but not presented in DEIS Table 5.7-2 or anywhere else that I could find in the DEIS) are low by similar factors as presented above. Since these rates are crucial input parameters to the AERMOD simulations of dust dispersal around the MBTL site, the results of these simulations will be correspondingly low by similar factors. This is especially significant because these lighter dust particles will remain aloft much longer and travel much farther than the larger, heavier particles included in TSP values. As this subject area is beyond my specific expertise, however, I can offer mostly general comments about this problem. More analytical work needs to be done to correct this glaring deficiency before issuing the final MBTL Environmental Impact Statement.

Much of the coal-dust emissions will occur at and around the coal-storage piles. As shown in the first two lines of my table above, the contributions of total suspended particulates TSP amount to between 13.8 and 24.1 tons/year in all — 40 to 144 percent higher than the *entire* 9.89 tons/year given in DEIS Table 5.7-2. Similar increases are to be expected in the PM10 and PM2.5 particulates to be entered in AERMOD simulations. And since strong winds occur from the southeast, according to wind roses in Fig. 4-8 of URS Corporation report's Appendix L, plumes of fugitive coal dust will occasionally be blown into the residential areas northeast of the MBTL facility.[14] This adverse impact is partially reflected in DEIS Figure 5.7-4 (on p. 5.7-19), but it will be substantially more severe. And the environmental impacts here will increase significantly once the fugitive dust released in unloading the coal trains is adequately treated and included in the mix.

The coal-dust emissions during ship loading at the piers will largely fall into the adjacent Columbia River and drift downstream with the current. Such an impact seems to be included in DEIS Figure 5,7-4, with a plume centered near the end of the pier. But it will be much greater and more significant due to the fact that the coal-dust losses from ship loading appear to be grossly underestimated in the URS Corporation report. As I estimated on p. 6 of this comment, the total annual emissions during ship loading could easily be as large as 12.6 tons/year — almost all of it ending up in the water. This dust dispersal must be simulated using AERMOD, as must its downstream drift and settling.

[14] Millennium Coal Export Terminal, Longview, Washington, Appendix L (2014/2015), pp. 21-25.

In the final analysis, much more and better analytical work needs to be done on the fugitive coal-dust emissions before they can be taken as truly representative of what will occur at the Millennium Bulk Terminals, Longview. What currently appears in the SEPA Draft Environmental Impact Statement and in the supporting URS Corporation report are gross underestimates, by factors of 2 to 7, of the various fugitive-emissions rates. These low values have been propagated through the AERMOD simulations and result in similar gross underestimates of the inhalable PM10 and PM2.5 particulates that will affect areas around the proposed terminal and the citizens living or working in those areas. The final SEPA Environmental Impact Statement for this project should include a thorough, objective assessment of these emissions. But achieving that goal will likely require that this work be done by another company, given URS Corporation's highly questionable performance on the draft EIS. The final draft of this work should then be peer-reviewed before publication by recognized experts such as UW Professor Jaffe.

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