26 February 2019

Gene Foster, Manager, Watershed Management
DEQ Water Quality Division
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232
Sent via e-mail

Re: *Comments regarding the Willamette River Mercury Total Maximum Daily Load (TMDL) Development*

Dear Gene:

The Oregon Farm Bureau (OFB), Oregon Forest & Industries Council (OFIC), and Oregon Association of Nurseries (OAN) submit this letter jointly to convey our comments pertaining to the Willamette Basin Mercury TMDL that your team at the Oregon Department of Environmental Quality (ODEQ) is developing. Our comments are based on our participation as members of the Advisory Committee for this TMDL and the very real impact this TMDL could have on our membership.

The OFB is a nonprofit organization that has been a voice for Oregon's family farmers and ranchers for 100 years. The OFB counts 7,000 members that raise 225 types of crops and livestock across the state. The OFIC is a nonprofit organization that represents over 50 Oregon forestland owners and forest products manufacturers who manage over 5 million acres of Oregon forestlands and employ nearly 60,000 Oregonians. The OAN is a nonprofit organization that provides a voice for over 700 nursery stock producers, retailers, landscapers, and other companies across the state.

Since the inception of our nonpoint source water quality programs, and for years before, our members have worked to protect, maintain and enhance water quality throughout the Willamette Valley. Due to emissions outside our control, we anticipate being asked to make substantial changes to our practices upon implementation of this TMDL. However, due to many shortcomings and uncertainties in the modeling that underlies this Mercury TMDL, we are concerned the load allocations in the TMDL could be substantially different if other reasonable modeling decisions and assumptions were used. We are writing to express our concern about the magnitude of the load allocations assigned to our sectors due to emissions outside our control and based upon a model with significant shortcomings and uncertainties.

Agriculture and Forestry are not the Source of Mercury Exceedances

The agricultural and forestry sectors have always been proactive about protecting, maintaining and enhancing water quality on agricultural and forestry lands, which combined represents by far the largest land use in the Willamette Valley. Indeed, our industries were proactive in developing the Agricultural Water Quality Management Program and Forest Practices Act years before most states had thought of developing their nonpoint source programs. Since that time, we have invested millions in studies, on-the-ground work, and compliance with our respective programs. We will continue to be proactive into the future, as evidenced by the millions invested by each of our sectors each year in proactive water quality improvements.

As it relates to mercury in the Willamette Valley, the ODEQ has admitted that our sectors are not the source of mercury exceedances, but rather are accepting mercury from foreign sources onto our land base and the waterways running through our lands. Mercury emissions outside the United States are understood to comprise a clear majority of atmospheric deposition in the Willamette River Basin, and atmospheric deposition, via direct runoff and contributions to soils and groundwater, accounts for the vast majority of the mercury load to the Willamette River system (Tetra Tech, 2018). Unfortunately, addressing this source of mercury in Oregon would require international accords and long-term emissions agreements negotiated by the United States. This is beyond the scope of what our state or agriculture or forestry could address. This simple fact has made writing this TMDL exceedingly challenging, and we do not envy ODEQ's work to address a source of pollutant outside its control. Although the mercury entering the Willamette River system from our land originated from the atmosphere, not our activities, we will continue to invest in water quality on our lands and meet our requirements under our respective programs. However, without addressing the real cause of the mercury exceedances, the discussion at the September 2018 Advisory Committee meeting suggested to us that this TMDL will may request reductions that are larger than any basin stakeholder can manage.

Oregon's farmers and foresters are doing an exceptional job investing in water quality improvements, studying water quality on our lands, and meeting the requirements of our programs, and we will continue to do so after this TMDL is adopted. That said, we have concerns about the modeling that we set forth below, and which we would like to see you address prior to adopting the TMDL.

Shortcomings and Uncertainties in the Modeling

We expect that your team will create a TMDL that allocates daily loads and wasteloads of mercury from nonpoint source areas and point source dischargers to the Willamette River System. Our understanding is that these loads will be based on the results of six separate computer models. Each of these models introduces uncertainty into the load allocations, and some of these models have been developed with questionable modeling practices. We describe a selection of these uncertainties and shortcomings below.

Modeling Practice

The consultants contracted by the EPA for this TMDL study have made multiple questionable modeling decisions that depart from best practices used in work of this nature. Notably:

- In three presentations to the Advisory Committee (February, August, and September 2018), the contractor's personnel have described no sensitivity analyses of the model output to reasonable variations in model input data sets or parameters. When asked about a sensitivity analysis for the biomagnification factor in the Food Web Model (FWM), Dr. Butcher, the contractor's project leader, stated that no sensitivity analyses have been performed to determine how the values of this crucial model input parameter might vary given other modeling decisions or how its variation might affect the calibration of the FWM. This implies that other reasonable values for this and other important modeling input parameters might also lead to satisfactory model calibrations. However, these different values would also lead to different outcomes for the target mercury concentration or modeling recommendations for load and wasteload allocations. This reduces our confidence that the TMDL load and wasteload allocations will be defensible.
- In Advisory Committee meetings and in documents produced by the EPA contractor, we have not seen consistent comparisons of model input parameters to available literature. Again using the biomagnification factor as an example, Dr. Butcher confirmed in the September 2018 meeting the values selected for this parameter have not been compared to a literature survey. The same lack of comparison exists for the mercury translator value selected. When these and other model input parameters have not been defended rigorously, we cannot be confident that this modeling follows common best practices.
- The Margin of Safety (MOS) provided by the modeling has not been quantified. The EPA contractor communicated to the Advisory Committee that this modeling uses an implicit MOS to ensure that aquatic resources and fish tissue are protected despite uncertainties in data, modeling, and lack of scientific understanding about mercury biogeochemistry in a complex river system like the Willamette. However, many conservative assumptions layer upon one another in this modeling, and we are concerned the TMDL study may have produced an overly conservative and indefensible target mercury concentration for the Willamette River. The most significant conservative assumption is the selection of the northern pikeminnow as the fish whose tissue must remain under the fish tissue standard. This is a highly conservative premise for these calculations because we doubt that anyone eats the quantity of northern pikeminnow that was part of the calculation that led to the fish tissue standard. The fish tissue standard itself is a separate conservative premise to this TMDL study. Without a quantification of the implicit MOS, we cannot be confident that the TMDL load and wasteload allocations will be fair and not overly conservative.

Food Web Model

The FWM links methylmercury exposure of fish to fish tissue concentrations based on an understanding of the Willamette River food web and the bioaccumulation and biomagnification within it. This model is calibrated so the concentrations of mercury in fish tissue match the concentrations measured in samples collected from the Willamette River and its tributaries.However, once calibrated, its main utility is to provide one of its parameters, the biomagnification factor, to the mercury translator model (discussed below). This introduces significant and compounded uncertainty to the target mercury concentration in the Willamette River. Specifically:

- The FWM calibration is poor for the northern pikeminnow. This is the only fish whose parameterization is used in the determination of the target concentration of mercury in the river system. We cannot tell how poor because no statistical evaluation of the quality of the calibration was provided in the contractor's modeling report, but inspection of Figure 3-5 in the report reveals the northern pikeminnow is the *only* one of eight modeled fish whose cumulative distribution function for fish tissue mercury concentration falls outside the 95% confidence interval determined by the field data (Tetra Tech, 2018). With this poor model calibration, we cannot be confident in the target mercury concentration.
- We understand that the model input parameters pertaining to three main processes were used to calibrate the FWM: the fish ingestion rate of mercury, the fish assimilation rate of mercury, and the fish elimination rate of mercury. From this, the necessary biomagnification factor is determined for the model to match observed fish tissue concentrations as closely as possible. We are concerned that there may be other reasonable values for these model input parameters that produce a decent match between the model output and observed fish tissue concentrations. If so, these would require different biomagnification factors for model output to match data. We acknowledge that this probabilistic model does not use single values for its model input parameters but instead expresses them as distributions. Nonetheless, there may be other reasonable distributions for the biomagnification factor that can lead to a good model calibration. This implies that the model could produce the "right" answer for the wrong reason. Consequently, we lack confidence in the target mercury concentration that is calculated, in part, from the biomagnification factor determined by the EPA contractor.

Mercury Translator Model

The mercury Translator Model uses the biomagnification factor from the FWM and a mercury translator value to calculate a target concentration of total mercury in the water column from the concentration of dissolved methylmercury used as an input variable to the FWM. We have several concerns about the mercury translator value calculated as part of this modeling effort. Two examples are:

- Several paired samples of mercury and methylmercury concentration have been aggregated into subwatersheds (at the HUC8 scale) of the Willamette River Basin, but this aggregation has not been justified. From these aggregated concentrations, a single mercury translator value is determined by a linear regression. We have not seen a robust justification for this aggregation of many observations into a single value. We have also not seen a quantification of the uncertainty of this single value for each subwatershed. This reduces our confidence in the target mercury concentration.
- The slope of the regression line calculated from the aggregation of individual pairs of measured mercury and methylmercury concentrations is heavily influenced by three pairs of data points; the remaining points do not fall in a line. We question whether linear regression is an appropriate statistical method for calculating the translator value. This leads us to doubt the validity of the target mercury concentration.

Mass Balance Model

The Mass Balance Model (MBM) exists separately from the FWM and the Translator Model. Whereas the FWM and Translator Model are used together to determine the target total mercury concentration in the water column, the MBM determines the present-day contributions of total mercury to the Willamette River system from a variety of sources. The comparison of the target total mercury concentration and the total present-day load of mercury to the river can be used when developing a TMDL. We believe the representation of nonpoint sources in the MBM are highly uncertain for several reasons:

- Results of three other models serve as important inputs or points of comparison for the contributions of nonpoint sources to the Willamette River system. These models are:
    - the hydrology model of the Willamette Basin created by the EPA contractor several years ago using the software package HSPF,
    - the model of dry atmospheric deposition of mercury used by Domagalski et al. (2016), and
    - the USGS LOADEST model from which the EPA contractor calculated total mercury concentrations in the Willamette River that were then used as a calibration target for the MBM.

For this reason, the TMDL will be based on six models, not the three commonly described by your team, the EPA, and its contractor. Using the output of two models as inputs of the MBM compounds uncertainty. Calibrating to the results of a separate model implies that the MBM is calibrated to match a number with its own, presently unquantified, uncertainty. While this may be unavoidable, we have seen no acknowledgement of these uncertainties and how they will be considered when writing the TMDL. Additionally, we have received no assurances that the HSPF and atmospheric mercury models have been rigorously reviewed as part of this TMDL process by someone other than the EPA contractor. We understand the FWM, Translator Model, and the MBM were reviewed by EPA staff, but we are concerned that, because the HSPF model appears in a prior report and the dry atmospheric deposition model appears in a paper about watershed mercury export, their results have been accepted without question in this TMDL process. This decreases our confidence in the representation of mercury loads to the river by nonpoint sources.

- The HSPF model raises some additional concerns:
    - Our experience suggests the model's representation of agricultural land may be poor. We are unsure of the impact of any inaccuracies on the final modeling results.
    - We have not seen an explanation of the justification of infiltration rates in this model. This is critical for the distinction used by your team between mercury attributable to atmospheric sources and to groundwater.
- The soil mercury concentrations interpolated from a 2013 USGS study appear to be highly uncertain due to a low spatial resolution of the observed data and a lack of detail in the interpolation.
- We do not understand the basis for the categorization of the results from the MBM. We cannot see how specific load and wasteload allocations can be generated from model results attributed to general categories like "forest" or "groundwater".

Modeling Summary

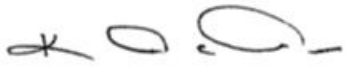
As the famous saying goes, "all models are wrong, but some are useful." We acknowledge that no model will represent a complex natural system perfectly and that compromises are necessary when input data are incomplete, science is uncertain, and budgets are limited. However, the six models used to inform the TMDL contain enough questionable decisions and inherent uncertainties that we are not confident in their utility. We are concerned the mercury load and wasteload allocations in the TMDL will be neither fair nor defensible. Additionally, reasonable alternative modeling decisions and model input parameter values could lead to meaningfully different mercury load and wasteload allocations, some of which might be less burdensome than the large reductions discussed at the September 2018 Advisory Committee meeting.

Conclusion

The membership of our three organizations will be among the nonpoint source dischargers regulated by the Willamette Basin Mercury TMDL. As such, they are subject to the modeling results in which we lack confidence. Consequently, the load allocations in the TMDL will be debatable and difficult to accept. We understand the inherent difficulty in this modeling exercise and we hope there is no need to challenge the model results. However, uncertain model results and debatable load allocations must be accompanied by a WQMP that allows our designated management agencies (the Oregon Department of Agriculture and Oregon Department of Forestry; henceforth, "DMAs"), which understand the challenges unique to our members, to lead the implementation of the TMDL for nonpoint sources. This is all the more important because of the dominant influence of atmospheric deposition on nonpoint source loads of mercury to the Willamette River. This source of mercury is out of our members' control, and DMAs understand best what our members *can* control.

Our organizations and the foresters, farmers, and growers of Oregon have done much in recent decades to protect surface water quality. From new stream buffers to wet weather haul rules to strategic implementation areas, we have worked with DEQ and our DMAs to protect the waters of our state. We thank you and your team at ODEQ for *your* work to improve waterways for all Oregonians as well. We look forward to continuing to work together as the Willamette Basin Mercury TMDL and WQMP are finalized in the coming months.

Sincerely,


Dave Dillon	Kristina McNitt	Jeff Stone
Executive Director	Executive Director	Executive Director
Oregon Farm Bureau	Oregon Forest & Industries Council	Oregon Association of Nurseries

Copies to:
Andrea Matzke, Willamette Basin Mercury TMDL Advisory Committee Manager, ODEQ
Priscilla Woolverton, Willamette Basin Mercury TMDL Advisory Committee Manager, ODEQ

References

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