Independent Review of “Proposed Daily Maximum Loads for Indicator Bacteria and Trash in the Lower Tijuana River”

Dr. Win Cowger, Research Scientist at the Moore Institute for Plastic Pollution Research, July 3rd, 2023

Based on my expertise and experience, I am reviewing the findings, assumptions, or conclusions I agreed I could review with confidence:

1.a. Are the proposed numeric targets in the draft staff report reasonable and adequately protective?

2.a. Are the seven transboundary flows the significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River?

3.a. Are the proposed TMDLs and load/wasteload allocations reasonable and adequately protective?

1.a. Are the proposed numeric targets in the draft staff report reasonable and adequately protective?

Question:

“The proposed trash numeric target for the lower Tijuana River is zero. The numeric target is derived from narrative WQOs established in the Basin Plan. The WQOs are based on preventing nuisance and protecting beneficial uses. The basis for proposing these numeric targets is primarily found in sections 3 and 7 of the draft staff report. The San Diego Water Board requests review of the appropriateness and adequate protectiveness of applying these numeric targets to the lower Tijuana River.”

Response:

- The target of zero trash in waterbodies has been a standard in California for over a decade. When this target was set, it was set out of an abundance of caution due to the complex nature of trash as a pollutant, the fact that there are no natural flows of trash, all are anthropogenic, and the fact that there are no known human or ecosystem benefits from trash in the environment. In recent years, the scientific community is experiencing exponential growth in research on trash and has upheld this target. This is because we are growing ever more aware that trash is a ubiquitous (Emmerik and Schwarz, 2019) and persistent contaminant (Rochman et al. 2013) with clear and diverse impacts to the environment under a variety of conditions (Rochman et al. 2019). Additionally, there are no known ecosystem or human benefits from trash. Some researchers have even stated that plastic pollution is a planetary boundary threat (Villarrubia-Gomez et al. 2018). A target of zero is adequately protective. That said, we have seen that the target of zero has never been achieved and therefore could be considered unreasonable. There is ongoing work to try and define a non-zero target for some types of trash, for example microplastics (Coffin et al. 2022). Coffin et al. 2022 leveraged a probabilistic method to define uncertainty bounds on thresholds for microplastics in waterways. Additionally, the California Trash Amendments have been working to set non-zero targets with a current target of < 5 gal/acre/year for Trash in California water bodies so that MS4 permittees could eventually be considered in compliance for trash discharge, however the scientific community has not thoroughly vetted the impacts of this target, and there is a lack of reproducibility in the methods employed to quantify the targets (Caltrans, 2023). There is not a clear mechanism for applying the Coffin et al. 2022 microplastics targets to trash and I do not feel that the California Trash Amendment target is ready to be used for the Tijuana Trash TMDL as it is still too new and likely impractical to employ across the border. However, I believe we may have a better understanding of achievable and adequately protective targets in a few years. I recommend continuing the course of using the zero threshold so that the ultimate vision of a world without waste can continue to be pursued by science, policy, and management.

2.a. Are the seven transboundary flows the significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River?

Question:

“Source analysis identifies the potential sources of pollutants that cause impairments in water bodies. The San Diego Water Board identified seven significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River: the Tijuana River Flood Control Channel and six cross-border tributaries. These point nonpoint sources of pollution carry wastes generated in Mexico across the border into the U.S., polluting the lower six-mile stretch of the river, including the estuary, and the downstream Pacific Ocean shoreline. The basis for identifying the significant sources of impairments is primarily found in sections 4 and 5 of the draft staff report. The San Diego Water Board requests review of the load calculations and the conclusion that the seven transboundary flows are the significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River.”

Response:

Section 2

- Reservoirs are a highly effective way to capture trash and I generally agree with the conclusion that much less trash is likely to enter the Tijuana River from the US side than from the Mexico side.

Section 4 and 5

- I agree that the seven transboundary flows are the significant sources of trash in the lower Tijuana River. There have been decades of work on these sources as listed in the references from several independent studies. Sources on the US side of the border are generally overestimated while sources on the Mexico side of the border are generally underestimated. Even with this discrepancy in estimation techniques, the US based sources are only 4% of the total expected sources to the Tijuana River.

3.a. Are the proposed TMDLs and load/wasteload allocations reasonable and adequately protective?

Question:

“A TMDL for a given water body/pollutant combination is based on the amount of pollutant the water body can receive without experiencing impairments (referred to as “loading capacity”) with a margin of safety applied to account for any uncertainties. Once the TMDL is established, pollutant sources receive load allocations for nonpoint sources and wasteload allocations for point sources. The draft staff report identifies load allocations and wasteload allocations so that the San Diego Water Board and

responsible parties can take appropriate control actions to achieve load allocations and wasteload allocations and attain water quality standards in the lower Tijuana River. The proposed TMDL for trash in the lower Tijuana River is zero, based on preventing nuisance and protecting beneficial uses. Therefore, the wasteload allocations for the seven identified significant sources of trash are also zero and the corresponding required wasteload reductions are 100%. The trash loading into the lower Tijuana River Valley was estimated for significant sources (transboundary flows) and potential U.S.-side sources. The basis for establishing TMDLs, load and wasteload allocations, and required wasteload reductions is primarily found in sections 4 and 6 of the draft staff report. The San Diego Water Board requests review of the appropriateness and adequate protectiveness of the proposed TMDLs, load and wasteload allocations, and wasteload reductions."

Response:

- My response to question 1.a. on whether the zero waste load allocation is reasonable and adequately protective applies here too. The following responses are focused on the calculation of the initial loadings.

Percent Loading Sheet in 2023-06-16_Load Estimates

- Percent loading calculated in the Load Estimates Excel spreadsheet appear correct, the percent load is calculated by dividing the annual load for the discharge by the total expected load from all sources.

U.S. Side Trash Calculations Sheet in 2023-06-16_Load Estimates

- I checked a few of the summary statistics in the U.S. Side Trash Calculations sheet and they were correct.
- There is a heavy reliance of "Los Angeles Regional Board, 2007" for the calculations of trash loads. This strategy has some major assumptions 1) that trash generation rates have not changed substantially in the last 20 years, 2) that trash generation rates in LA are similar to those in the Tijuana Watershed. These assumptions are problematic because trash input to the environment is increasing (Eriksen et al. 2023) and there is high spatial variability in trash generation rates in California (Cowger et al. 2022). See additional comments about sections 4, 6, and Appendix C.
- I would recommend an approach where uncertainties are incorporated into the loading calculation to more adequately assess our certainty about sources instead of calculating single values.
- The assumption that open space & parks land use type will be similar to agricultural seems reasonable. However, if plastic is heavily used in agriculture within the watershed, we may expect agriculture to have a larger input of trash to the environment than open space and parks (Steinmetz et al. 2016). I recommend investigating whether plastic use is widespread in agriculture within the watershed and if so, accounting for it in the calculation.

- The substitutions where high density single family residential and industrial land use are exchanged for others seem reasonable.

Cross-Border Trash Calculations Sheet in 2023-06-16_Load Estimates

- It is unclear within this section where the sources of data are coming from, I would recommend citing them similar to the US Side Trash Calculations Sheet inside of the dataset. I also recommend adding a comment that discusses why a scaling factor is used for some calculations but trash abundance and density are used for others and how these scaling factors are calculated.
- Using a scaling factor to estimate trash loadings using sites with higher certainty in their calculations seems reasonable.

Section 2

- I agree that reducing trash and bacteria will likely result in reducing most of the other contaminants. However, I can forsee a future scenario where we have removed trash and bacteria but not these other contaminants. Bacteria is primarily connected to sewage so let's imagine a scenario where that has been eliminated. Trash is typically defined as material larger than some threshold (e.g., 5 mm), so let's say in this future scenario we have screened all particles larger than that from the flows. We are left with small particles in the flow and dissolved compounds that do not pass through wastewater treatment. Some other contaminants listed can be bound to these small particles, e.g., Sediment, Selenium, Organics, Phosphorous, and Cadmium, or be dissolved and not pass through wastewater, e.g., Pesticides. I think trash and bacteria are a good starting point for this TMDL, but I recommend that loads of these other contaminants be considered in future work to measure progress and ensure that contaminants are not slipping through the cracks.
- This section mentions that dry weather flows are diverted directly to the ocean for some basins. However, accounting for this isn't indicated in Appendix C.

Section 4, 6, and APPENDIX C

- It should be clear somewhere what the particle size ranges of interest are for each dataset and the analysis. Suppose one study assesses particles greater than 1 ft in size and the other 1 mm in size. In that case, you could get very different numbers just because of differences in the methods, not necessarily related to the loadings.
- It seems reasonable not to calculate the upper watershed fluxes.
- The trash loading calculation for the Tijuana River Flood Control Channel seems reasonable. Still, I want to comment that trash loading to the waterbody is underestimated because some trash will pass beyond the sediment basin. I am glad that was mentioned in this section; this will hold for all estimates using trash captured in sediment basins instead of total loadings. I am not aware of a strategy currently to calculate a sediment basin's trash capture efficiency, but that

would be one way to estimate the total trash loading using the sediment basin data.

- Stewarts drain trash loading calculation seems reasonable. The scaling factor used here and for the other unmonitored basins seems reasonable. I should also mention that trash loading is controlled by both land use (Cowger et al. 2019) and hydrology (Cowger et al. 2023). In this case, I would assume that hydrology is pretty similar as long as the watershed are close to one another (similar climate) and have a similar size and shape. However, the report doesn't currently mention hydrology as a rationale for the scaling factor. Looking at the Table shared with Lee and Lyndon, hydrology is likely pretty similar, with no more than one order of magnitude difference in watershed size and runoff.
- It is unclear to me in this section what year the loading estimates are supposed to apply to. Most of the data appear to be from 10 years ago. I would recommend stating that these estimates are for a past baseline and are not current.
- I think the load calculation for HSA 911.12 is reasonable. I agree with the statement for HSA 911.12 that using land-based trash generation rates and assuming that they will be equivalent to fluxes is likely an overestimate. I think the overestimation is driven primarily by improvements in litter generation in the last 20 years. From reading the LA report mentioned as the basis for the trash generation rates, it appears that although the report was published in 2007, the data for their calculations is from 2001. I also think there are more up-to-date and accurate waste load allocations that could be used here, for example, the BASMAA trash generation rates from 2014 (BASMAA, 2014). I recommend reviewing that report to see if this more up to date estimate can be used in place of the LA report estimate.
- It surprises me that MS4 permittees don't have better estimates of trash losses to the Tijuana River and that we need to use the LA report estimates for land use to assess loading from them. The MS4 permittees should all be monitoring and reporting loadings of trash directly. It may be worthwhile to contact them to see if they have higher-resolution data they can share.

References

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