TECHNICAL ADVISORY COMMITTEE MEETING #14, 2/19/2020

Wednesday, February 19, 2020, 10:00 a.m. – 12:00 p.m.

Ecology Bellevue Office
Meeting Room 1AB
3190 - 160th Ave. SE
Bellevue, WA

TAC MEETING PARTICIPANTS

- Jeff Burkey, King County
- Elly Hale, EPA
- Will Hobbs, Ecology Environmental Assessment Program
- Todd Hunsdorfer, King County
- Jessica Huybregts, Ecology Water Quality Program
- Kristen Kerns, US Army Corps of Engineers
- Bo Li, Ecology Water Quality Program
- Cleo Neculae, Ecology Water Quality Program
- Elsa Pond, Washington State Department Of Transportation
- James Rasmussen, Duwamish River Cleanup Coalition
- Pete Rude, City of Seattle/Seattle Public Utilities
- Blair Scott, King County
- Kevin Schock, King County
- Jerry Shervey, Ecology Water Quality Program
- Jeff Stern, King County
- Ralph Svrjcek, Ecology Water Quality Program
- Anthony Wenke, Ecology Toxic Cleanup Program
- Debra Williston, King County
- Iris Winstanley, Leidos
- Yi Xiong, Ecology Water Quality Program

WELCOME AND INTRODUCTIONS

Bo Li, Ecology Water Quality Program engineer, welcomed everyone and led the group in a round of introductions. She provided an overview of the agenda for the day. The meeting's objectives included updating the TAC on the project's progress including information about pursuing a technical support contract, purchasing the receiving water model software, and QAPP updates, a discussion about extending the receiving water model's upstream boundary, and providing some preliminary calibration results for the watershed model.

PROJECT UPDATES

Bo Li presented the project status updates and reviewed the project timeline.

- In 2020, working on the HSPF Watershed model. Temperature and toxics will be separately calibrated. The project team have been working on QAPP updates. We are continually working on empirical loading analysis. Modelers also started the preliminary work for the receiving model development.

- USGS Study has been published. We will show you later how we used that data in the model. Groundwater Database Report Final available at: **USGS Open-File Report 2019-1131:** Assessment of Existing Groundwater Quality Data in the Green-Duwamish Watershed, Washington https://doi.org/10.3133/ofr20191131.
- RESPEC contract –
    - There is another project within our Duwamish watershed, Soos Creek Total Maximum Daily Load study, led by our Ecology's Environmental Assessment Program (EAP) that is also using the HSPF watershed model. The Soos Creek TMDL project only focused on the hydrology and sediment transportation. Therefore, to make both our studies more efficient and get some more technical assistance for our modeler, both Soos Creek TMDL team and PLA team worked together on the HSPF technical assistance contract. The Soos Creek TMDL team have some experiences working with RESPEC and learned that they have some internal tools that could help with the calibration and also has some HSPF experts who can provide technical support for the project as an outside reviewer. So we worked on the sole contract to work with their team to provide technical assistance for both of our project.
    - Tech support for PLA will focus on 3 tasks:
        - Task 1. Brief review of model set-up and documentation
        - Task 2.Sharing of scripts and tools related to HSPF calibration (sediment transport, pollutant fate and transport, and temperature models). This is one of the main reasons we worked with them as we learned they have developed some scripts and tools that can expedite the calibration process. Calibration can always be a very tedious process with a lot of back and forth. With their tools, hopefully, can make this process a little easier.
        - Task 3.Review of HSPF model set-up descriptions for management scenarios. For our project, how to set up management scenarios is very important. Unlike the TMDL project (where the management scenarios are more straightforward), our PLA project can be more complicated as we have had a lot of discussion on this topic. So have some outside expert to review our setup will definitely be beneficial.
    - Contract is about $50K to cover both projects.
- EFDC Software purchase:
    - We have been working with Dynamic Solution Inc., the company that developed the EFDC Explorer Modeling System (EEMS), on the purchase of the software.
    - We received approval from Ecology management to purchase the Lifetime license, which means no additional maintenance fee is needed. It should be good for lifetime, as long as their company still exists. They will also provide technical support and training for our modelers. This is a single license. We will install in our new server that our IT staff provided for our PLA modeling team in Ecology and multiple people can use it if needed.
    - We believe it is a good investment because other TMDL projects or similar water quality modeling projects in Ecology could use this software in the future. It is quite a versatile model. We already tried out a trial version to make sure it works with our Ecology server and computer, and everything works out great.
    - At this time, our purchasing department is finalizing some details with the purchase and we expect to get the license soon.
    - Approx. $70K for the software.
- Receiving water model updates:
    - For the receiving water model, we have already started some of the preparation work.
    - We developed the receiving water model grid which combined Lower Duwamish and Elliott Bay grids.

- The combined grid has been extended to USGS12113000, which is the station in the Green River near Auburn, which is beyond River Mile 17.
- Our modeler is also working on hydrodynamic model inputs and bathymetry data. We need to make sure we have all the hydrodynamic data ready for the boundary condition.
- Receiving water hydrodynamic model upstream boundary:
    - It came to our attention that it might be better to extend the model grid for receiving water hydrodynamic model upstream boundary from River Mile 17 (which is probably the location that was decided in previous TAC meeting, also, Tetra Tech says: "It is therefore advisable to extend the EFDC model to this location." in the 2016 original QAPP) further upstream to the USGS station at Auburn. The reason to originally extend to river mile 17 was to ensure the receiving water model will cover all the areas that have tidal influence. Now, there are suggestions to extend it further to the station at Auburn which is around RM 19 (approx. a 2 mile extension) just for hydrodynamic model. Our team took a look at that location and the data availability and we do find some pros and cons of further extension of the upstream boundary to RM 19.
    - Input from Yi about going upstream to the USGS station at RM 19: The additional data will be helpful for model setup and also to evaluate the groundwater flow. Here are the pros and cons of extending receiving water upstream boundary to USGS station at Auburn:
        - The USGS station 12113000 in Auburn provides a more accurate and complete long term flow boundary condition dataset. There are also some historical suspended solids and water quality measurements at this location. So with those data from this USGS station, it will help with our hydrodynamic model calibration and also will help with the evaluation of groundwater inflow to Lower Green River. We could use USGS12113390 Duwamish River at Golf Course (RM9.8) as sediment transport and toxic fate and transport modeling upstream boundary. So for the sediment transport and toxic fate and transport modules, we don't necessary need to extend to the Auburn location if it turns out that the extension will significant increase the run time without benefits.
        - *Question from Debra:* Do we need bathymetry data for this?
            - Yi: We have some already from Portland State University. King County and Portland State University implemented Green River CE-QUAL-W2 hydrodynamic and water quality study (Duwamish River, near Tukwila RM11.2 → Flaming Geyser Park RM45.0). If we use RM17, we still have the same data issue.
        - However, the downside of this is that it will moderately increase the hydrodynamic model computational time comparing with RM17 (approx. 15% extra).
        - Our intended plan is to extend the grid for now. This is the easy part; the real time-consuming part is when we will need to input the data, set up the parameters and start the calibration, and we still have some time to decide if we want to do that. Right now, our modeler's opinion is we can extend to the Auburn location mainly because of the measured continuous Green River discharge data , which avoids the regression and travel time analysis and reduces the hydrodynamic model uncertainty. However, we do want to be careful about committing to that because it might further delay the project if it turns out it is more time-consuming than we expected. We would like your input on this topic. Please identify reasons why extending to Auburn will help our project or some of your questions. Hopefully, by our next TAC meeting

(toward the end of this year) we can make a decision on this. Meanwhile, we will keep working on getting the input data ready and setting up the hydrodynamic model.

- Questions/comments:
  - Pete Rude (Seattle Public Utilities): How does the QAPP address the boundary extent now?
    - Yi: Tetra Tech says: "It is therefore advisable to extend the EFDC model to this location." in the orginal 2016 QAPP. In March, 2015's TAC meeting:
    - Bo: Since we are currently updating the QAPP, if it is confirmed that we will need to extend the grid before the completion of this QAPP update, we can mention it in the new QAPP.

2. Where should the up-gradient spatial extent of the receiving water model be?

- Question: Why is the up-gradient spatial extent important?
  - Ecology and EPA explained that the spatial extent influences which sampling points are included and impacts whether tidal influence is captured in the model.
- Comment: The current King County model boundary could be used because it represents the extent of tidal influence. This boundary goes just past "the rapids" feature, near I-405.
- Comment: Tidal influence has been observed at the USGS gauging station at 200th Street.
- Comment: The up-gradient extent could be expanded farther, beyond the current King County model boundary. USGS mentioned that the tidal influence can reach RKM 27 (RM 17) under low flow condition.

TAC Recommendation: *The up-gradient spatial extent of the receiving water model should be at least as far up-gradient as the current King County model to include tidal influence, with the potential to expand it further as the model is further developed.*

In short, TAC, USGS and Tetra Tech said we can extend to RM 17 now (not that we <u>will</u>). RM17 could be mentioned for the first time by USGS in its tidal influence study.

- Debra Williston (King County): Does the QAPP mention all the additional data?
  - Bo: We can update the QAPP for these data. It's not already captured in the current version of the QAPP.
- Bo: We want to make sure it will generate useful information.
- Yi: We try to get better inputs before we start model runs.
- James: We're projecting rising tides into the future.
- Jeff Stern: Taking the model up to RM 17 already added 20-25% computational time. It's still questionable as to whether you are gaining anything out of that. There's no flow reversal in that area, it's just tidal height. I'm not convinced that it's worth it. Extra computational time for what benefit?
- Debra: How much of a tidal height rise is there?
- Want to know what the extra data will tell us and how it will help us with the management scenarios.
- Kevin: You could run it at the current condition, then run at RM 17, and RM19 and see how much it changes the hydrodynamics.
- Jeff: Adding more data means you'll be limiting the number of runs you'll be able to do (# of management scenarios). You'll do less of everything, including sensitivity. Worried you're leading down this path that you're limiting what you will accomplish.
- Pete: In the future, can you change it back?

        - Bo: It would waste the time that you used setting it up if you go back. Don't expect to have a conclusion/decision today. We want your opinion on this. Once we get the model we can see how the hydrodynamics works.
    - Kevin: Also figure out how uncertain your upstream flows are.
    - One thing should be clarified: For hydrodynamic model, we would like to extend the hydrodynamic model boundary to USGS12113000 Green River near Auburn. However, for sediment transport and toxic fate and transport modeling upstream boundary, we could use USGS12113390 Duwamish River at Golf Course (RM9.8) or nearby sediment/toxic sampling location, due to previous extensive studies and data collections around RM10. Thus, the flow boundary conditions (discharge, salinity, temperature) at upstream boundary around RM10 will be generated by RM17 or RM19 hydrodynamic model to drive sediment transport and toxic modeling.

- QAPP Updates:
    - We would like to point out some major changes to this QAPP since the previous version. This QAPP is mostly based on the previous QAPP developed by Tetra Tech. But because our Ecology modeling team is taking over and we no longer work with Tetra Tech, it is an Ecology project now, and we needed to update this QAPP based on Ecology's QAPP structure/requirements.
    - Originally, Tetra Tech's QAPP followed EPA's guidance since it was funded by EPA. In this version, the biggest change is that we modified the structure to follow Ecology's QAPP guidance, which has quite different required sections and format. As such, there are a lot of new sections that we added based on the new QAPP outline. Most of those are just project backgrounds and project management, like abstract, summary of previous studies, systematic planning process, organization and schedule and etc.
    - When you review the revised QAPP, all the new sections that we added are highlighted in grey.
    - Besides all the new sections, you will also noticed there are some new languages in the modeling sections. That means our modelers have edited the original QAPP based on the new information we received or there are new modeling tools that are available since the last QAPP. All the major changes are also highlighted in grey in the revised QAPP. Besides all the highlighted sections, there are some minor edits throughout the QAPP. This QAPP has been reviewed by multiple members of our project team and modeler team.
    - New/updated QAPP sections:
        - **2.0** Abstract
        - **3.2.2** Summary of previous studies and existing data
        - **4.4** Tasks required
        - **4.5** Systematic planning process used
        - **5.0** Organization and schedule
        - **7.4** Assumptions in relation to objective and study area
        - **7.5** Possible challenges and contingencies
        - **10.2** Corrective action process
        - **11.5** Model information management
        - **12.0** Audits and reports
        - **14.1** Process for determining project objectives were met
        - **14.2** Treatment of non-detects
    - The modeling team (Yi, Jeff, and Kevin) and the project team (Cleo, Jessica, Bo, Elly) have already reviewed the QAPP.

- **QAPP Watershed Model Section**: In the watershed model section, there are not a lot of changes. Jeff added watershed model objectives. We changed references from LSPC to HSPF since we already made

the switch. Also as Jeff mentioned in the last TAC meeting, the HRU definition has been reconfigured because the change from LSPC to HSPF. In the process, we added age of development as one more criteria in the HRU setting. We decided to use 1980 as the threshold for different pollutant loadings. This is because the PCB ban was in place in 1970s, but there might be some leftover PCB products that were produced or used between 1970s to 1980s. According to all the comments we decided to use 1980s as the cutting point to differentiate the loading from different land uses.

- We also want to point out that, there were some comments from TAC members about using building materials as the criteria for HRU. But unfortunately, we just couldn't find enough information to support our watershed model. We couldn't find sufficient building materials information in the area. So for now, we decided to just use age of development to classify our HRU.
- Besides the age of development, we also renumber the combined, partially combined and separated areas in LDW.
- Also, in the revised QAPP, we added the two new data sources. The **atmospheric loading** rate will be derived from King County report and Leidos database and **groundwater loading rate** will be derived from the 2019 USGS report.

- **QAPP Receiving Water Model Section:**
  - Using Dynamic Solution (DS) version EFDC.
  - Simulate three-phases organic toxics: divide dissolved into Freely dissolved and DOC-complexed
    - three phases: Freely dissolved, POC-sorbed (POC = particulate OC) and DOC-complexed (DOC = dissolved OC)
  - Will include two more bed-water processes/pathways:
    - bioturbation/particle mixing
    - dredging residuals – Questions from group: HOW DO YOU DO THAT?
      - Will the suspended sediment in dredging be assigned to top layer or bottom layer of sediment bed (water column?)?
      - Jeff: Will it be a short duration event? Done in different tidal situations?
      - Overall: That's not in the QAPP and will take work to incorporate.
      - Kevin: I would be cautious because you could have an infinite # of possibilities but get the same value. If you cannot absolutely define the parameter set, it can take info away from something else. When you're looking at this make sure you can define it property.
      - Bo: Appreciate the comments/questions. We will need to consider that going forward.
  - Will develop a sediment bed layering scheme for toxic modeling:
    - active layers
    - archive layers
  - Will develop a relationship between PCBs aroclors and congeners for sediment bed.
  - Debra: We should to use the Duwamish site data. Go to the data evaluation report. Be cautious of literature values that are not site-specific.
  - Salish Sea Model (SSM) organic carbon results could be used for toxic partitioning.
  - Wind-wave issues:
    - Wind-wave will not be modeled
    - Wind-wave's effect on bottom shear stress can be evaluated using DS wind-wave sub-model
  - Will consider ship-induced bottom shear stress (see LDW STM sediment transport analysis).
  - Extend the PLA receiving water hydrodynamic model grid
    - to at least RM 17

        - possibly to further upstream @ USGS 12113000 Green River near Auburn (~RM 19)
    - Debra: Monthly measurements in East Waterway and the LDW Total and dissolved OC data collected. Lots of data available for multiple years. Whole water column. Ask me if you can't find the data. The CTD data is on the website. Request the OC data (years) from Debra and she could get it.
    - Jeff: The SSM doesn't go into the LDW. What is it used for then?
        - Bo: It does go into the 5 RMs of the LDW.
        - Jeff: I wouldn't trust the SSM for within the LDW.
    - Will: Question about partitioning and fractions: Based on theoretical partitioning or using the real data?
        - Yi: Use the data. The DOC is based on the POC (with an adjustment factor). The POC is real data.
        - Seems like the categories overlap with the work that USGS has done at the golf course.
            - Yi: That will be used for the receiving model.

WATERSHED MODEL UPDATE – JEFF BURKEY:

Jeff Burkey, a modeler at King County, provided an update on the watershed model and further details on the input parameters used in the model calibration.

- Broken up into 10 segments/model domains.
- Rainfall: We are now doing this more coarsely.
- Fairly similar to original model setup.
- Age of structure: Based on assessor's database. Using that as a surrogate for PCB loadings. 1980 is the cutoff point.
    - Debra: From SCWG perspective, it's also the type of construction, not just age dependent. We might be assigning a higher load than is actually happening. How can we do a sensitivity analysis on this?
        - Jeff Burkey: Age is one attribute, but it's also zoning (residential vs commercial). It lets us discriminate.
- Sewer basins: Obtained the delineations from same source as Tetra tech. Still need to reconcile the delineations – SPU and King Co have different delineations.
- Impervious surface: Didn't differentiate different types of impervious surfaces (roofs vs roads vs other hard ground) in the original modeling, but we will be doing that in the current model.
- Debra: Why are roofs considered not pollutant-generating?
    - Jeff Burkey: When we calibrate the model, we will find that roofs are pollutant generating. Put that in your comments to ensure we clarify that.
- Land use: Roads have been added as a distinct category.
- Soils and slope: No changes from original model.
- Hydrologic Response Units (HRU): Model can only do 1000 HRUs. So we have done some merging. Simplified into 293 HRUS per rainfall zone.
    - The model outputs is at catchment scale, not at the HRU scale.
    - In the LDW, there are more storm sewer system-related.
- Debra: Can we increase the scale of these maps?
    - Bo: I expect we would produce those maps in the modeling report. We can talk about how to provide info to the Source Control Work Group (SCWG). SCWG might be able to provide more comments about the maps.
- Water Temperature Calibration:
    - Atmospheric Inputs for each zone, get converted with different equations.

        - Also need to input ground temperature and channel temperatures, and channel shade. 55% shade for all reaches is the starting point. We will individualize and refine as needed. Not going to model ground shade, building shade etc.
        - This is one of the underlying pieces of the model (not a management scenario).
        - See Modelling Pathways slide for flowchart. Shows overland pathways and channel pathways.
        - You can model both TOC and DOC.
    - Watershed PCB Calibration:
        - At this time we have defined the boundary conditions, atmospheric deposition, groundwater concentrations, and bed sediment concentrations. Need to include the land use data (accumulation rates, wash off rates, and storage limits).
        - Initial atmospheric deposition on land and water. Used dry deposition (known as "bulk" elsewhere). Constant monthly values. 3 zones of loading rates. Used the data that the County and Leidos database have.
        - Initial landscape parameterization: Land use accumulation not set yet. Assuming it's the same concentrations all year round.
            - Jeff Stern: Which data were included in the PCB groundwater dataset?
                - Jeff Burkey: The 2019 USGS study data.
    - Modeling progress: Still need to improve some TSS inputs. Completed flow and groundwater calibration, but overall we're just at the beginnings of the calibration process.

WATERSHED MODEL (HSPF) INITIAL CALIBRATION RESULTS – YI XIONG

- Temperature modeling demonstration
    - Yi presented the statistical calibration targets for HSPF based on literature values.
    - Results of the temperature calibration confirms that the HHD boundary condition is appropriate.
    - Duwamish (Golf Course Tukwila) location confirms that the watershed calibration is good (this will be our primary calibration station), as do other sites (except location 09a on Soos Creek).

- PCB modeling demonstration
    - Watershed calibration locations have whole water PCB concentration and particulate PCB concentration data.
    - Air deposition data – divided into 3 zones. Each zone is assigned a value. Zone 1. Duwamish, Zone 2. Black River/Lower Green, Zone 3. Soos/Upper Green.
    - Comment on PCB load graphs: change the scale so we can see more details on the comparison between observed values and model outputs.
    - Debra: How does the model incorporate storm conditions (high concentrations without a release from the dam)?
        - Jeff Burkey: The wash off factor will capture that kind of info.
    - James: Disappointed that we don't have enough time to go into these results in depth. What stormwater data are missing (Rainier Valley, Mt. Baker)?
        - Jeff Burkey: The delineations we got were from wastewater. We still need to confer with SPU about their delineations.
    - James: Understand we're trying to keep things simple, but the goals and objectives need to be kept in mind all the time. We need to understand what work can we do in the upper watershed, and be more accurate about that work.
        - Jeff Burkey: We don't have any point sources in the model right now, and we will need to add that. Anything associated with sources by land use type can be modified in the model.

        - Debra: The more you can share your data sources, the more we can identify what you may be missing and need from us.
        - Bo: We will work with SCWG to confirm the data sources and gather comments from SCWG to improve our data quality.
    - Next Steps with Calibration:
        - Double check PCBs and sediment data.
        - If applicable, specify spatial and temporal variation
            - groundwater and bed concentration
            - potency factor
            - partition coefficients
            - adsorption/desorption rate, and etc.
        - Meanwhile, examine sediment transport calibration as needed.
        - Add seasonal PCBs concentration and load comparisons.
        - Continue the temperature calibration for streams:
            - include water temperature data from Leidos database
                - mainly monthly and seasonal data
            - specify spatially varying parameters in HSPF Module RCHRES (Channel):
                - solar radiations
                - conduction-convection
                - Evaporation etc.
        - Work on other toxics following the same procedures as PCBs.

NEXT STEPS

Bo presented the next steps. TAC's next steps will be to provide QAPP comments (please submit to pla@ecy.wa.gov). The project team will compile comments, respond to the comments and edit the QAPP as needed. We will work with our Ecology QAPP QA staff to approve and sign the final QAPP. Once we get the final version, we will send out the final QAPP to TAC.

We anticipate we will have our next TAC meeting in fall/winter this year. We are hopeful that by then we will have more toxic calibration results from the watershed model and we should already be ready for some management scenarios. In the meantime, we should get our receiving water model data input ready and software ready to start our EFDC development.