GREEN-DUWAMISH POLLUTANT LOADING ASSESSMENT

TECHNICAL ADVISORY COMMITTEE

June 18, 2015

Meeting 5

DEPARTMENT OF ECOLOGY State of Washington

EPA

TAC Meeting 5 Agenda

Time	Topic
9:00 am	Welcome & introductions
9:10 am	Recap interested parties meeting
9:25 am	Candidate parameters
10:00 am	LDW EFDC Model
10:30 am	Break
10:45 am	LDW Food Web Model
11:10 am	Watershed Model
11:40 am	Comments from the audience
11:55 am	Next steps
12:00 pm	Adjourn

Recap interested parties meeting

Role of Interested Parties

- Open forum for all stakeholders to provide input on development of the PLA
- Review key technical questions and topics
- Hear about work of the TAC and progress on the PLA overall

PLA Interested Parties Meeting

- Attendance: 65
- Meeting format: Presentations, panelists, small group discussion
- Kick off meeting to develop interest in PLA, explain role of PLA, get initial feedback on process and scope

Small Group Discussions

1. **PLA use and development:** List the benefits you envision the PLA will bring to your jurisdiction, business or organization, as well as any concerns you have regarding development and use of the PLA.
2. **Parameters selection and data collection:** Discuss your comments or concerns regarding the proposed candidate parameters list. What are your thoughts on data collection for these parameters?
3. **Future water quality management:** Any specific water quality management practice or source reduction strategy you would like to see developed along with the PLA?

How will feedback from Interested Parties be used?

- Inform next steps:
  - Data Assessment and Data Management
  - Modeling Quality Assurance Project Plan (QAPP)
- Inform future process:
  - Involvement of business community, other agencies
  - Coordination with other projects

Candidate Parameters

Relationship between Project Goals and Candidate Parameter List

1. Address water, sediment, and tissue quality impairments under the Clean Water Act in the Green-Duwamish watershed, including the Lower Duwamish Waterway (LDW).

2. Prioritize pollutant reduction efforts in the watershed to minimize recontamination of remediated LDW sediments

Candidate Parameter Selection Criteria

Tier 1

- Focus on Toxics
- CWA impairments
- CERCLA human health and ecological risk drivers
- Does the chemical bioaccumulate (Kow>5)
- Chemical linked to fish tissue consumption advisory

Tier 2

- Chemical linked to endangered species concerns
- Is there a sediment recontamination concern
- Do we have data to support modeling
- Can the chemical be simulated with the proposed models
- Can the chemical represent similar chemicals in terms of sources and pathways

Green/Duwamish River Watershed

Pollutant Loading Assessment

Technical Advisory Committee Meeting
June 18, 2015

DEPARTMENT OF ECOLOGY
State of Washington

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TETRA TECH

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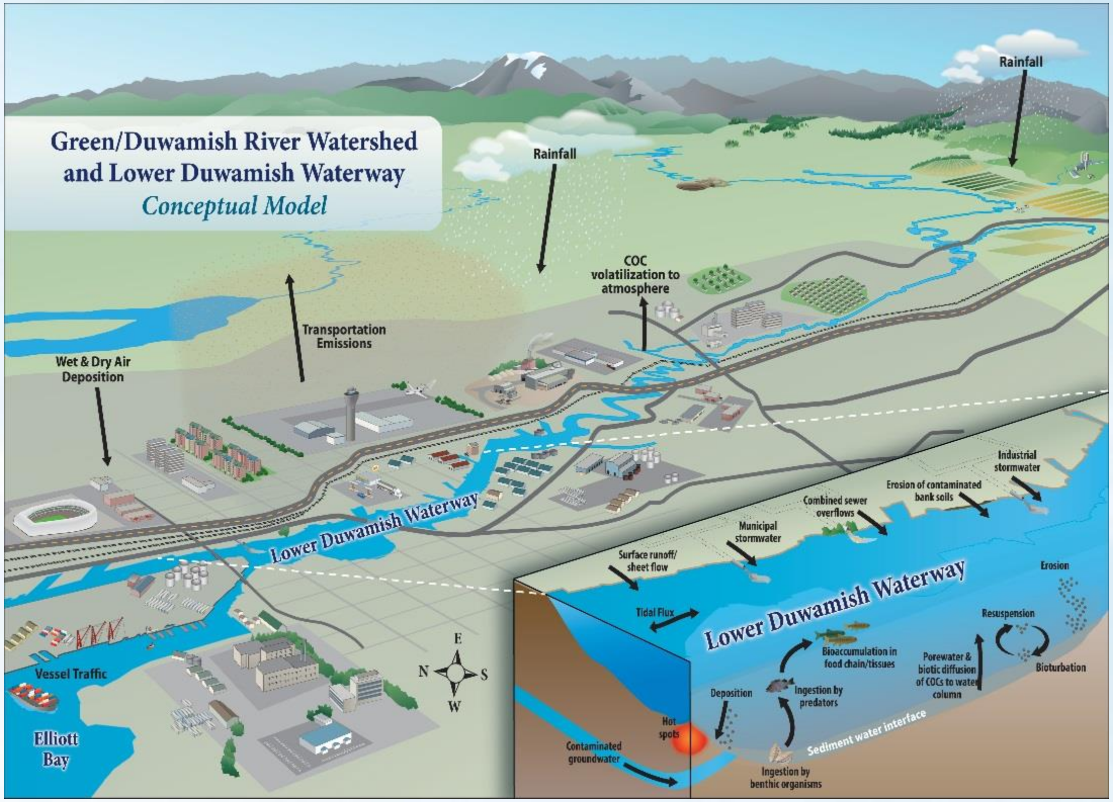
Overview

- ► Pollutant Recommendations
- ► Data and Knowledge Gaps
  - EFDC
  - Food Web Model
  - Watershed Model



Data gaps/pollutant groupings memo

- Focus on priority candidate parameters
- Pollutant behavior and groupings
- Data and knowledge gaps for all three models
- Information supports the initial QAPP
- Last TAC
  - Discussed components of the work
- Today
  - Present and discuss summaries of gaps and options to address

CANDIDATE PARAMETERS

Candidate chemicals for modeling

Parameter	Fate and Transport	Food Web	Justification
PCBs	Y	Y	High concern to both WQ and CERCLA, accumulate in biota, fish consumption advisory, recontamination potential
cPAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, indeno(1,2,3-cd) pyrene)	Y	Y	High concern to both WQ (most 303d listings) and CERCLA, accumulate in biota, ecological concern, recontamination potential
Dioxins/Furans (2,3,7,8 TCDD)	Y	Y	High concern to both WQ (most 303d listings) and CERCLA, accumulate in biota, ecological concern, recontamination potential
Arsenic (inorganic)	Y	N	Concern for both WQ and CERCLA- natural background issue
Phthalates (Bis-2EH phthalate)	Y	Y	Primarily concern for CERCLA, recontamination potential, accumulates in biota- surrogate for other phthalates
Copper	Y	N	Aquatic toxicity concern for ESA species- indicator for built environment
Zinc	Y	N	Aquatic toxicity concern for ESA species- indicator for built environment
Mercury	Y	?	Limited 303d listings, concern for CERCLA, fish consumption advisory

Summary of knowledge gaps and options for candidate pollutants

Gap	Options and Recommendations
Lack of paired filtered/unfiltered data for site-specific partition coefficients	1- Use literature values that may not reflect local conditions. 2- Collect paired data to evaluate coefficients and improve accuracy **Recommendation: Team should consider Option 2**
Data to directly constrain rates of exchange from sediment into water column (non-polar organics)	1- Treat exchange rates as calibration parameter. 2- Constrain rates based on field evidence. **Recommendation: Ongoing work by MIT for USACE may provide field data for the LDW, enabling use of Option 2.**
Data for PCBs reported as Aroclors	1- Use Aroclor data only, providing a consistent basis for analysis. 2- Assume unaltered Aroclors to interpret congener concentrations and total PCBs from Aroclors; combine with congener data. 3- Use samples analyzed for both Aroclors and congeners to evaluate site-specific relationships between environmentally altered Aroclors and congeners in the LDW. **Recommendation: Option 3 is preferable for accurate analysis of PCBs. This takes advantage of available data and allows better specification of kinetic parameters.**

Summary of knowledge gaps and options for candidate pollutants (continued)

Gap	Options and Recommendations
Dioxin/furan data	1- Simulate behavior of selected dioxins/furans using available data and literature coefficients. 2- Delay simulation of dioxins/furans until ongoing data collection efforts produce sufficient information to calibrate a model. **Recommendation: Option 2. The same simulation framework employed for PCBs can be used for dioxins/furans once additional monitoring data are available.**
Lack of methylmercury data	1- Simulate total mercury only. 2- Attempt to simulate mercury methylation using literature values. 3- Collect methylmercury data to support modeling. **Recommendation: Option 3 is preferable if mercury is to be modeled; however, lack of data suggests that mercury should not be modeled at this time.**
Copper, zinc, and arsenic redox chemistry	1- Simulate ionic metals as general quality constituents that can deposit to or erode from the sediment but are otherwise conservative. 2- Represent ionic metals partitioning to solids and solubility using the method recommended by USEPA (1996); modify model codes to rep. 3- Collect additional data & develop a detailed geochemical simulation. **Recommendation: Option 2 appears most feasible alternative for copper and zinc. Option 1 should be sufficient for arsenic.**

Recommendations on chemicals and groupings for modeling

Parameter	Issues	Recommendation
PCBs	Group of 209 congeners with a wide range of chemical properties. Simulating total PCBs as a single state variable will lead to inaccuracies, but it is not feasible to simulate 209 congeners individually.	**Simulate reduced set of PCB homolog groups (fate and transport and FWM).**
Carcinogenic PAHs	Group of 8 chemicals with differing properties	**The cPAHs can likely be simulated as a group with approximated characteristics; however, further data analysis is necessary to make a final decision (fate and transport and FWM).**
Dioxins/ Furans	Data are limited; simulating only 2,3,7,8-TCDD will not represent full toxic potential associated with this group.	**Delay modeling until additional data are collected.**

Recommendations on chemicals and groupings for modeling (continued)

Parameter	Issues	Recommendation
Arsenic (inorganic)	Determination of natural background concentrations may be an issue.	Simulate inorganic arsenic only using a simplified mass balance approach (fate and transport only)
Phthalates	DEHP was suggested as a surrogate for other phthalates.	Simulate DEHP. Use as a surrogate appears reasonable (fate and transport and FWM)
Copper	Aquatic toxicity evaluation requires dissolved concentration.	Simulate dissolved and sorbed inorganic forms using USEPA (1996) methods adjusted to local data (fate and transport only).
Zinc	Aquatic toxicity evaluation requires dissolved concentration.	Simulate dissolved and sorbed inorganic forms using USEPA (1996) methods adjusted to local data (fate and transport only).
Mercury	Lack of data for methylmercury hampers evaluation of risk and bioconcentration potential.	Do not model mercury at this time.

LDW EFDC MODEL

EFDC

- RI/FS foundation
- Updated model domain
- Data summary
- Initial conditions
- Boundary conditions
- Calibration
- CSOs
- Data and knowledge gaps

Summary of data, knowledge gaps and options for EFDC model

Gap	Options and Recommendations
Data limited in some media; gaps exist for initial, boundary, calibration data	1- Use all available information including data and previous models to develop a model now of recent historic conditions. 2- Collect additional data and delay modeling to the future. Data collection needs to be coordinated to obtain initial, boundary, and calibration data sets in all media. **Recommendation: Start developing and calibrating the model with available data and use model to guide needs for new data collection.**
Limited data for assigning initial conditions in water column	1- Assign low levels of initial toxics and equilibrate with sediment using a model spin-up period. 2- Collect data if the modeling period is in the future. **Recommendation: Use model spin-up combined with existing data; test sensitivity of model results to this assignment.**
Data for sediment initial conditions and remedial actions over time	1- Rely on existing data and use previous model results if modeling a historical period. 2- Collect new data if the modeling period is in the future. **Recommendation: Rely on existing sediment data, but also account for interim remedial actions over time. Applying the model to multiple years can be used to test simulated responses to remedial actions.**

Summary of data, knowledge gaps and options for EFDC model (continued)

Gap	Options and Recommendations
SSC and toxics loadings from CSOs	1- Use existing CSO monitoring data and event volume modeling combined with best 2- estimates of pollutant concentrations. 2- Combine CSO model and monitoring data with watershed model simulations of surface stormwater-derived loads. **Recommendation: Use CSO model to develop time series of mixing ratios and estimate CSO concentrations based on fractions of stormwater and sanitary sewage. Use HSPF/LSPC to estimate stormwater concentrations and monitoring data for sanitary sewage concentrations. Confirm model performance relative to CSO outfall monitoring.**
SSC and toxic loadings from upstream	1- Use watershed model results for modeling a historical period. 2- Continue collection of comprehensive toxics data from the watershed and develop the model in the future. **Recommendation: Existing HSPF models are calibrated for flow and sediment. Develop the upstream loading with a combination of these models and existing data; continue collection of new data to fill knowledge gaps for LSPC simulation.**

Summary of data, knowledge gaps and options for EFDC model (continued)

Gap	Options and Recommendations
Limited toxics data in water column; site-specific evaluation of some kinetic parameters	1- Use available data and literature to approximate kinetic parameters. 2- Collect new field data to gain knowledge. 3- Conduct laboratory experiments to fill knowledge gaps. 4- Conduct literature review to fill knowledge gaps. 5- Conduct model sensitivity and uncertainty analyses to fill knowledge gaps. 6- Collect synoptic data for a modeling period in the future and delay model implementation. **Recommendation: Develop model beginning with available data. Options 1 to 5 can all be potentially used to further constrain the data and knowledge gaps the model based on resource availability. Initial model development will greatly assist in determining the cost:benefit ratio of specific types of data collection.**

LDW FOOD WEB MODEL

Food Web Model

- Previous model
- Existing data
- Data and knowledge gaps

Summary of knowledge gaps and options for Food Web Model

Gap	Options and Recommendations
Contemporaneous data in all media and biota	1- Conduct comprehensive new round of synoptic data in all compartments 2- Use models to estimate temporal changes in stores **Recommendation: Option 2 is recommended despite being suboptimal due to the large cost of new comprehensive surveys.**
Dietary sources of individual species	1- Conduct gut content surveys 2- Rely on existing data **Recommendation: Rely on existing data (2), but supplement prior FWM effort by soliciting additional information from wildlife and university sources.**
Limited tissue and exposure data for dioxins/furans	1- Collect additional data 2- Perform modeling based on limited extant data 3- Do not model dioxins/furans at this time **Recommendation: Based on the contaminant-specific analyses, do not apply FWM to dioxins/furans at this time.**

Summary of knowledge gaps and options for Food Web Model

Gap	Options and Recommendations
Methylmercury	1- Collect additional data to characterize methylmercury exposure 2- Simulate based on approximations from total mercury **Recommendation: Do not pursue FWM simulation of mercury at this time.**
Limited modeling tools for evaluating bioaccumulation of arsenic, copper, and zinc; limited data on factors controlling bioavailability	1- Do not model bioaccumulation of metals 2- Use DYMBAM model for bioaccumulation of metals **Recommendation: Base analysis for these constituents on ambient WQS for protection of aquatic life rather than bioaccumulation models. Do not implement DYMBAM.**

GREEN/DUWAMISH RIVER WATERSHED MODEL

Watershed Model

- Focus data gap review on water quality
- Tied to watershed sources and pathways
- RI/FS
- Previous models (status and HRU config)
- EIM data
- Recent and ongoing data/studies
- Data and knowledge gaps

Summary of knowledge gaps and options for watershed model

Gap	Options and Recommendations
Limited data for dioxins/furans	1- Do not model dioxins/furans in the watershed 2- Pursue additional data collection prior to modeling 3- Use model to develop a preliminary analysis of key dioxins/furans **Recommendation: Combination of options 2 and 3. The watershed model should be used to develop a preliminary scoping analysis of dioxins/furans (focusing on 2,3,7,8-TCDD as a surrogate) using an approach similar to PCBs. Sensitivity analyses to guide additional data collection needs.**
Limited data for copper, zinc, mercury, and DEHP in the Upper Green River	1- Collect additional data prior to modeling 2- Assume loads are driven by geology and/or atmospheric deposition and proceed with modeling. **Recommendation: Option 2 is recommended because loads are expected to be small from this relatively undeveloped area. Sensitivity analyses.**

Summary of knowledge gaps and options for watershed model

Gap	Options and Recommendations
Poor status of existing TSS calibrations in certain subbasins	1- Use existing calibrated parameters 2- Expend effort to improve calibration **Recommendation: Because movement of sediment is key to the movement of sediment/solids-sorbed pollutants, effort should be expended to improve the existing TSS calibration.**
Further instream watershed data for parameters in general to support model validation	1- Collect additional data prior to modeling 2- Proceed with model calibration and collect additional data to support further validation in the future **Recommendation: Option 2 is recommended. While data is deemed sufficient for initial model configuration and calibration, the data sets to support instream calibration do not span long periods of time. Sensitivity analyses with the model can be used to inform additional data collection.**

Questions and Discussion