PugetSoundPartnership
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Water Quality
Comments Submitted via E-mail
4/14/2008 – 5/9/2008

From: Grant Nelson

Date: 05/9/2008

Comment: Subject: Water Quality Topic Forum –Initial Discussion Draft

This letter presents initial comments by the Association of Washington Business on the Water Quality Topic Forum discussion paper. AWB is Washington State's chamber of commerce and many of our 6,500 business members are located in the surrounding Puget Sound area. We recognize that the Sound plays an important role in our state's economy and the need to address a number of environmental concerns related to water quality and other challenging issues.

The AWB fully supports the comments submitted by the Master Builders Association of King and Snohomish Counties on this discussion paper.

General Comments
1. The Introduction identifies that this Water Quality discussion draft and review process is to assist in creating the 2020 Action Agenda. We appreciate the opportunity to offer comments on the document and further understand the PSP is on a short timeline for developing Action Agenda recommendations. The "Initial Discussion Draft" is a significant document and it has served to stimulate thinking and discussion. The Partnership should recognize, however, the impracticability of completing a technical review and preparing substantive comments on this topic paper in the three week period provided. If the PSP desires serious and comprehensive feedback, that need should be clearly communicated and sufficient time provided.
2. We note also the many embedded requests for more information on certain topics and the listing of gaps in knowledge. Once again, if the Partnership is sincere in wanting a dialogue with interested stakeholders, a more defined and lengthy process will be needed to review and react to information that might be provided in response to these requests.

3. While many technical paper citations are presented, a list of traceable references is not provided. A detailed reference list is a prerequisite to facilitate an assessment of the underlying science-based information.

4. The organization of the Initial Discussion Draft seems logical, but the

quality and presentation of information is differential and sometimes redundant. It is difficult to gain a sense of priority on the problems and potential solutions. As one example, the discussion in Science Question 1 seems to equate the mere presence of measured pollutants with there being a water quality problem. In some cases the information suggesting water quality impairment is anecdotal. Care should be taken in the presentation of information to avoid this specific inference. An assessment of actual designated use impairment might provide a more useful perspective and help to prioritize future actions.

5. The Initial Discussion Draft was sometimes disappointing in its discussions (and apparent understanding) of various regulatory programs. For example, there is little recognition of the role of TMDL's (or Water Control Plans, in WDOE parlance) as the primary Clean Water Act regulatory process to address CWA Section 303(d) Category 5 impaired waterbodies. This management approach should be prominently featured someplace in the Policy Question 1 discussion, perhaps with a review of recently-completed and ongoing project work. Similarly, the Discussion Draft evidences a poor understanding of stormwater permitting programs – the types, timing of implementation, role of BMPs, adaptive management processes, etc.

6. Neither the P1 nor P2 questions on Policy Approaches to Address Water Quality or Strategies to Improve Water Quality chose to examine certain important issues. These would include:
- government jurisdiction coordination -- multiple levels, multiple programs, multiple objectives. In short, the governance issues.
- cost of improvement efforts; funding sources –public and private
- incentive-based approaches in combination with regulatory

We would welcome a continuing opportunity to participate in the Puget Sound Partnership process.

From: Debby Hyde

Date: 05/9/2008

Comment: Before I knew the date of the comment period, I asked staff from the various Pierce County agencies to review the topic papers and provide comments. When I realized our review date was later than your requested date, I still felt it important to collect them and send them on for your use. Some of the comments are very general and probably similar to others. But some staff had very specific thoughts as you will see in the accompany attachment. I

hope you will find them useful.

Water Quality Topic Forum
General Comments:
There is little mention in the paper about agricultural lands and forest activities as a source of water quality degradation. In some basins, particularly with rural and resource lands, this is an important source of nonpoint source pollution problems.
Low impact development techniques should be emphasized as a key approach to address impacts associated with new development. Low impact development is emerging as a promising approach for addressing water quality and quantity impacts from urbanization to treat stormwater and infiltrate water back into the ground.
Stormwater retrofitting of already built-up areas, most of which were constructed without stormwater treatment will be important if we are to improve water quality in many urban areas. This can occur over time in association with redevelopment efforts or through targeted programs focused on retrofitting existing urban areas.
The paper primarily focuses on water quality parameters; it would be helpful to also include discussion of beneficial uses and bio-indicators (e.g., B-IBI, fish bioassays).
There is an over-emphasis on the NPDES stormwater permits as the solution for addressing stormwater problems. While it is an important program, there are many other programs not covered by NPDES permits that should also be emphasized. This includes basin planning and implementation, watershed nonpoint action plans, flood management, and habitat improvements and protection.
Source control efforts (whether related to stormwater or wastewater discharges) are likely to be one of the most cost-effective approaches for addressing water quality problems in Puget Sound. While this often comes down to individual behaviors and the success of educational efforts, it has not really been tried on a sustained, widespread basis to gauge the effectiveness of such efforts.

Specific Comments

Page 3, para. 2 – This section should also note water temperature and dissolved oxygen as important water quality parameters of concern for freshwater in Puget Sound.

Page 4, section A. – It would be helpful to have more geographic specificity (or give example locations) on where these documented threats are a problem in Puget Sound.

Page 13, Gaps in knowledge – This section should also note the limitation of our knowledge of synergistic and cumulative effects of pollutants on aquatic biota (e.g., effects of exposure to multiple chemicals and exposure over time).

Page 15, bulleted list – Add local governments working with business partners on source control activities

Page 16, last para. – This section should note that TMDLs do not require implementation, and there is limited funding, and because of this, virtually no history that TMDLs have successfully resulted in beneficial use attainment. If we want to prioritize TMDLs as a key approach to achieving water quality standards, we need to adequately fund implementation.

Page 17, LID methods – As noted above, low impact development should receive much greater emphasis in the paper as an approach for managing water quality problems from new development. Pierce County and other jurisdictions are now requiring LID in some sub-areas or basins as a means to reduce impacts and protect aquatic resources.

Page 18, Contaminated Sediments – A key issue with cleanup of contaminated sediments is ensuring that the sediments do not become re-contaminated from runoff from urban areas (industrial, commercial, residential).

Page 19, Gaps in Understanding – One gap in our knowledge of the effectiveness of alternative management techniques relates to the effectiveness of the approach/ technology itself vs. the quality of implementation. This is particularly true for temporary erosion and sediment control techniques, but also is relevant for stormwater treatment and maintenance activities.

Page 20, Existing regulatory or management programs – This section should specifically note watershed nonpoint action plans (developed under WAC Ch. 400-12). These plans address nonpoint sources from urban, agricultural, forestry activities, as well as onsite septic systems, boats and marinas and other sources.

Page 20 – NPDES municipal stormwater permits are an important part of managing water quality associated with stormwater runoff, but it is important to note that municipalities have many other programs that benefit water quality. For example, Pierce County has a comprehensive basin planning program focused on reducing flood hazards, improving water

quality, and protecting and improving floodplain and habitat. Pierce County also emphasizes implementation of watershed action plans and working with watershed councils.

Page 25, Wastewater: Onsite Sewage Systems – Lack of funding to correct failing septic systems or require upgrades is an ongoing problem. Pierce County Public Works and Utilities, Water Programs recently initiated a grant and loan program, with support from the Washington Dept. of Ecology, Tacoma Pierce County Health Department, and Pierce County Community Development Corporation. This program holds promise, but there are challenges with the cost of repairs and the amount of available state funding.

Page 27, Comprehensive Watershed Planning – There are barriers to cross-jurisdictional watershed planning and implementation. Watershed councils that work across jurisdictional boundaries can help, but more formalized structures may be necessary for comprehensive planning and implementation. These structures should be customized to individual watersheds.

Page 28, Principles for water quality improvement – This is a good bulleted list for water quality improvement. Under bullet one, it should note the importance of stormwater retrofitting in already built-up areas, during redevelopment, and the potential of low impact development in areas of new development.

Page 29, Preliminary recommended near-term strategies – This section should also include a bullet on runoff from agricultural and forested areas. For agricultural areas, this would include emphasis on farm planning and implementation of farm best management practices. For forested areas, this includes consistent implementation of the forest and fish agreement, with specific emphasis on maintaining riparian buffers and attention to runoff and sediment transport associated with logging roads.

From: Derek Poon

Date: 05/09/2008

Comment: After sending this acceptance notice to EPA people, I got a nice set of comments indicating sediment is listed in Idaho. Leigh Woodruff stated:

Just wanted to comment on your email below on the statement that sedimentation is not usually listed under 303(d). Clean sediment is considered to be a pollutant under the CWA, and if it is impairing

beneficial uses or otherwise causing violations of WQS, it should be listed under 303(d). Hundreds of clean sediment TMDLs have been written here in Idaho. While most of these were driven by EPA listings in 1994, the State biological assessment methodology is identifying additional streams with sediment impairments which need TMDLs. Hopefully Washington's assessment methodology will pick up these sediment impairments such as in the Lake Sammamish watershed. Idaho is now also using EPA's CADDIS causal assessment tool to help identify which pollutants are causing impairment.

I left out "in Washington" in my statement to you. Sorry.

The challenge is that sedimentation (not contaminated sediment or TSS) and flow are usually not listed under CWA 303d IN WASHINGTON; as
you can tell from my report, that makes it very difficult to treat the problem. A sediment TMDL can be done, such as for Upper White and Simpson HCP, but Ecology has not shown an active interest at this time.

The business of 303d listing and TMDL is a complex topic and my purpose is not to point fingers, because I would have to pick up a good share of the responsibility myself. My point is simply that all available tools be used creatively to address the Lake Sammamish type of predicament in Washington and elsewhere, so we don't end up working with an end result such as listing, but work proactively with prevention and avoidance. That may be the take home message from lessons from the past.

From: Andrea Copping

Date: 05/09/2008

Comment: On behalf of the staff of the Pacific Northwest National Laboratory (PNNL) Marine Sciences Laboratory staff, I would like to commend you and your staff for pulling together the five topic papers. There has been a great deal of thought and expertise brought to bear in creating these papers in a very short time, and they have provided an excellent point of departure for moving towards the Puget Sound Partnership Action Agenda.

I have worked with a number of PNNL staff to coordinate comments on the papers and I append those comments for four of the papers here. We have focused for the most part on scientific findings that should help to inform management decisions in Puget Sound, and we draw from programs in

which we have been intimately involved, generally in partnership with agencies, tribes, and academia.

I would like to credit our scientific staff in Sequim and Richland for contributing to these comments, including Dr. Irv Schultz, Jill Brandenberger, Dr. Tarang Khangaonkar, Dr. Gary Gill and Dr. Charlie Brandt.

Water Quality Topic Paper

We commend the authors for framing the main pollution sources in PS and broadly identifying the major contaminant classes. We divide our comments between those for conventional contaminants (nutrients) and toxics, as well as defining the need for a computational model of Puget Sound that will support many aspects of water quality and other management issues.

Conventional Contaminants
The authors faced a challenge of not having many long term or comprehensive reports or datasets to examine. As a result of this, those data that are available can sometimes play a stronger role than is appropriate.

Recent emphasis on low dissolved oxygen and eutrophication in selected Puget Sound embayments (most notably Hood Canal) are appropriately referenced in the paper. However the reader is left with the impression that eventually all of Puget Sound is likely to suffer the same fate. This is simply not correct. Surface waters of any part of the Sound can be found to be nutrient-limited at some time in the year, however the fast flushing and overturn of the larger basins prevents eutrophication from occurring. Studies throughout the 1970 and 1980s in advance of expansion of Metro's (King County's) West Point sewage outfall documented this in detail. Less intense monitoring since then by King County and PSAMP confirm the finding. Greater specificity in pinpointing the regions of the Sound where surveillance is needed for early signs of euthrophication will allow us to target scarce resources with the best return. This targeting will also will prevent a stampede by local governments towards nutrient reduction from treatment plants Sound-wide, which will be extremely costly and ineffective in addressing the most critical issues facing the Sound.

Toxic Contaminants – Organic Compounds
The authors have captured the status and importance of the broad classes of toxic contaminants of concern to native species and habitats. However, we believe that further emphasis on EDCs is needed, in particular the recognition that these chemicals have been found in stormwater, in some

cases at higher levels than in wastewater.

The authors discuss well-established contaminant classes (PCBs & PAHs); we strongly believe that more focus and additional information is needed on emerging POPs such as polybrominated diphenyl ethers and perfluorinated compounds. Further clarification is needed so that the reader is not confused about the identity of many of these compounds – i.e. PCBs / PAHs are not PBDEs, which in turn are not PFOA / PFOS and related perfluorinated compounds. The health issues (toxicological concerns) surrounding the various POPs are different. Also, the potential exists for synergistic interactions with POPs and EDCs / pharmaceuticals.

The paper highlights EDCs in wastewater but most emphasis seems to be placed on results from direct analytical measurements; the implication is that if we cannot measure or repeatedly detect the compound, it may not be a concern. The flaw in this approach is that it resembles looking for a needle in the haystack; it is easy to miss a critical sampling window when a release is occurring or lack sufficient analytical detection to measure potent EDCs when present at low (<10 pp-trillion) levels. We believe that biomonitoring needs to be emphasized in order to bridge the knowledge gap between the limits of direct analytical measurement and actual release & exposure. The authors acknowledge the value of biomonitoring (page 3 para 3) "..the measurement of some pollutants is difficult, since they cannot be detected until they have accumulated in tissue samples of shellfish, fish, marine mammals, and other species". However, biomonitoring is never emphasized as a strategy. We recommend including an emphasis on biomonitoring linked to specific biomarkers that are indicative of EDC (and other contaminant classes) exposure. Field sampling of feral fish / shellfish or caged deployment of fish (what we are interested in doing) and subsequent measurement of specific biomarkers can be a powerful tool for identifying the presence of contaminants.

A recent study by NOAA-NWFSC (Johnson et al 2008) clearly demonstrated the presence of unnatural estrogen / xenoestrogens in some regions of PS based on measurement of the biomarker vitellogenin in English sole. The increased use of biomonitoring / biomarkers would complement ongoing monitoring efforts for levels of select POPs. Many toxicologically important EDCs / pharmaceutical agents (ethynylestradiol [EE2] for example) do not bioaccumulate appreciably; without the use of biomarkers, such contamination is easily overlooked with conventional analytical approaches.

REFERENCE CITED

Johnson, L. L., D. P. Lomax, M. S. Myers, O. P. Olson, S. Y. Sol, S. M. O'Neill, J. E. West, T. K. Collier. (2008). In press. Xenoestrogen Exposure and Effects in English Sole (Parophrys vetulus) from Puget Sound, WA. Aquatic Toxicology

Toxic Contaminants – Heavy Metals
The paper addresses many of the management and policy issues associated with water quality in the Sound. The areas in which we believe the paper could be strengthened are largely associated with the step between scientific investigation and management/regulatory programs.

We believe there is a need to address how water quality standards might be updated to address toxicity associated with complex mixtures such as stormwater. Data collected for most storm water loading programs shows significant variability and uncertainty; understanding the range of loadings for various land use and land cover classification will help reduce uncertainty and allow for optimally focused investigations. We (PNNL) with US Navy have worked on a program in Sinclair/Dyes Inlet that we believe can inform the management of stormwater. The program (ENVVEST) has not been referenced in the paper. An example of our findings is the significant source of copper and zinc leaching from anti-fouling paint and zinc anodes from boats. The most important citations for the ENVVEST program are:
http://www.ecy.wa.gov/programs/wq/tmdl/sinclair-dyes_inlets/index.html or http://www.ecy.wa.gov/programs/wq/tmdl/sinclair-dyes_inlets/sinclair_cd/DATA/Data_Directory.html

ENVVEST Citations:
Brandenberger JM, CW May, VI Cullinan, RK Johnston, DE Leisle, B Beckwith, G Sherrell, D Mettallo, and R Pingree. 2007. "Contaminant Concentrations in Storm Water Entering the Sinclair/Dyes Inlet Subasin of the Puget Sound, USA, During Storm Event and Baseflow Conditions." Presented by Jill Brandenberger at 2007 Georgia Basin Puget Sound Conference, Vancouver, BC, Canada on March 27, 2007. Manuscript published in the proceedings, PNNL-SA-55447.

May CW, VI Cullinan, JM Brandenberger, C Judd, and RK Johnston. 2007. "Development of an Empirical Water Quality Model for Stormwater and Watershed Land-Use in Puget Sound." Presented by Valerie I. Cullinan at 2007 Georgia Basin Puget Sound Research Conference, Vancouver, BC, Canada on March 27, 2007. Manuscript published in the proceedings PNNL-SA-54936.

Johnston RK, DE Leisle, JM Brandenberger, SA Steinert, M Salazar, and SM Salazar. 2007. "Contaminate Residues in Demersal Fish, Invetebrates, and Deployed Mussels in Selected Areas of The Puget Sound, WA ." Presented by Robert K. Johnston at 2007 Georgia Basin Puget Sound Conference, Vancouver, BC, Canada on March 29, 2007. Manuscript published in the proceedings PNNL-SA-55152.

Brandenberger, J. M., C.W. May, V.I Cullinan, and R. K. Johnston. 2007. Surface and Stormwater Quality Assessment for Sinclair and Dyes Inlet, Washington. Technical Report PNNL, In final review

May, C. W. and V. I. Cullinan (2005). An Analysis of Microbial Pollution in the Sinclair-Dyes Inlet Watershed. Richland, WA, Pacific Northwest National Laboratory. http://www.ecy.wa.gov/programs/wq/tmdl/sinclair-dyes_inlets/reports-documents.html

We believe there are several water quality management programs that could be further informed by scientific investigations, including:

The impacts of metals on the marine environment and biota of Puget Sound can best be assessed by creating loading estimates using a mass balance framework. This approach will allow us to better understand the relative loads from tidal exchange in Puget Sound, and is particularly important for relatively conservative dissolved metals in seawater, such as arsenic, and for metals that are naturally enriched in the Pacific Northwest, such as cadmium. Information about the connectivity of Puget Sound marine waters with those of the Pacific Ocean will provide better understanding of the circulation, dissolved oxygen trends, climate changes, and contaminant fate and effect. Key references include:
Brandenberger, J.M., E.A. Crecelius, P. Louchouarn, S. Cooper, E. Leopold, and K. McDougall. 2008. “Natural Fluctuations in Coastal Hypoxia: Relationships between Large-Scale Climate Drivers and Deep Water Oxygen Levels Recorded in Sediment Core from Puget Sound, WA”. Presented at 2008 ASLO Ocean Sciences Meeting, Orlando, FL March 2-7, 2008, PNWD-SA-8013.

Cooper, S. J. M. Brandenberger, E.A. Crecelius, P. Louchouarn, E. Leopold, and K. McDougall. 2008. “Reconstructing Trends in Hypoxia using Multiple Paleoecological Indicators Recorded in Sediment Cores from Puget Sound, WA”. Presented at 2008 ASLO Ocean Sciences Meeting, Orlando, FL March 2-7, 2008, PNWD-SA-8012.

Understanding the natural recovery rates for metals in Puget Sound will help

assess current and project future contaminant levels. Recent work on the recovery of lead, copper and arsenic in cores in central Puget Sound will be publish shortly. The citation and abstract are presented here:

Brandenberger J.M., EA Crecelius, and P. Louchouarn. 2008. "Historical Inputs and Natural Recovery Rates for Heavy Metals and Organic Biomarkers in Puget Sound during the 20th Century", Environ. Sci. Tech. September 15 issue.

Sediment cores were collected in Central Puget Sound from one location near Seattle and one near Tacoma during three coring studies conducted in 1982, 1991, and 2005. The core reconstructions clearly show increased inputs of inorganic (Pb, Cu, and As) and organic markers (lignin and soil biomarkers) during timeframes relevant to human activity and environmental regulations. The three coring studies provided the opportunity to calculate a simplistic natural recovery rate for the 20th Century using a regression of surface sediment chemistry versus elapsed time. Sediment concentrations of Pb and Cu were estimated to recover back to pre-industrial conditions circa 2020-2030. However, this method may not represent the 21st Century with increased urbanization in Puget Sound and the subsequent rise in the importance of nonpoint source inputs. In fact, nonlinear trends in the 2005 cores for Pb and Cu suggest a slowing of the 20th Century recovery rate. While As has shown near complete recovery due to removal of the point source, 21st Century recovery rates for Pb and Cu project recovery around 2030-2060.

We also see some disconnects between current understanding and water and sediment quality management programs:

The authors state that sediments found in Puget Sound water fall below sediment quality standards; however it is well known that certain metals, particularly those that bioaccumulate like Hg, pose risk well below the state sediment quality standards.

We believe TMDLs are an important water quality management tool that can direct remediation efforts for water bodies that fail to meet water quality standards; TMDLs are not discussed as such in the paper.

The paper focuses on CSO events as a significant degrader of water quality. While CSO events may be important to small localized areas, the magnitude of potential loading from storm water (especially small storms) significantly outweighs the infrequent CSO events. We believe that a process for setting priorities based on risk drivers would be of great value to local governments

and regional entities in focusing funding efforts for maximum return on water quality investments. Another ENVVEST publication illustrates this priority:

Brandenberger, J.M., E.A. Crecelius, and R.K. Johnston. 2008. Contaminant Mass Balance for Sinclair and Dyes Inlets, Puget Sound, Washington. In review, PNNL 17499.

Modeling of Puget Sound
We are pleased to see the authors of the paper see the need for a model of Puget Sound (page 33, third bullet) "…Models that simulate circulation patterns in Puget Sound…' We believe this is a key underlying need for effective management of water quality.

The Need for a Model - Persistent loading from stormwater discharges, point sources, and runoff has been identified as major causes of pollution in Puget Sound. Based on lessons learnt from other sites in U.S, nutrient management and restoration strategies, employed based on predictions from the bay-wide model with limited nearshore resolution had extremely high uncertainties. The model predictions were not useful in developing strategies at the local scales of point sources and nearshore restoration actions. In the Puget Sound for example, in the Elliot Bay / Duwamish River alone, there are 7 CSOs and nearly 60 stormwater discharges. To accurately simulate the impacts from these discharges, and to correctly predict the benefits from source control / restoration actions, circulation and mixing, effluent transport and water quality, and toxics fate and transport simulations are needed at the "sub-mixing zone" resolution. In addition to pollutant loading, the nearshore habitat in Puget Sound has also been impacted due to human development. The loss of estuarine functions such as movement and mixing of salt and freshwater, and, loss of sediment and nutrient supply, have degraded the tidal marshland habit and affected salmon populations. Restoration efforts currently underway focus on recovering fundamental nearshore processes such as tidal hydrodynamics, estuarine processes, and the restoration of tidal channels which provide fish habitat and pathways. A high resolution hydrodynamic model is therefore highly desirable with the ability to predict hydrodynamic circulation, effluent toxics and sediment fate and transport, and simulation of water quality variables.

Puget Sound Model - A detailed hydrodynamic model with a focus on the complex nearshore coastal and estuarine regions of Puget Sound is recommended. The model should simulate tidal circulation, wetting and drying of marshlands and mudflats, and the transport process of freshwater river plumes, sediment, and water quality in the Puget Sound nearshore

environment. A predictive model of this nature would provide a much needed guidance to restoration design, monitoring, and address future conditions. With numerous restoration projects under consideration, simulations would provide an assessment of cumulative benefits and impacts associated with the planned alternatives. The proposed model would provide the framework to address cumulative benefits of multiple restoration projects in the Puget Sound.

With a detailed hydrodynamic component as described above, a water quality and sediment transport model simulating basic eutrophication kinetics and nutrient balance may be developed. The immediate benefit of a predictive water quality/sediment transport model of the nearshore region is to provide regulatory agencies a tool to conduct Wasteload Allocations in the estuarine and coastal environment. The benefit is the ability to predict effluent plumes from multiple point and non-point sources in the Puget Sound simultaneously. The water quality model set up should include the primary eutrophication constituents that affect dissolved oxygen in the nearshore environment: temperature, ammonium, nitrite, nitrate, organic nitrogen, soluble reactive phosphorus, total phosphorus, chlorophyll a (phytoplankton), biochemical and sediment oxygen demand, and sediment nutrient releases. Ability of the model to incorporate toxics kinetics to assess and manage the contaminated sediments issue in Puget Sound is also desirable.

The primary benefit of a comprehensive predictive tool as described above to water quality managers is that it provides them assistance in planning and management decisions. It helps prioritize pollutant reduction, cleanup, and restoration actions. The model results will be used to guide regulatory management actions such as source control, nutrient reduction strategies, serve as an advisory tool for beach bacteria pollution. A model of this capability could be used in conjunction with the nearshore restoration actions to assess potential water quality benefits through improved flushing and circulation provided by the nearshore tidal marsh restoration actions.

Other benefits of a Puget Sound Model include:
• Provide water quality and hydrodynamic input to Ecosystem Foodweb models
• Provide input to oil spill models for emergency response and Natural Resource Damage Aassessment
• Help design and direct future data collection and monitoring efforts
• Provide a framework for assessing the cumulative effects and benefits of multiple source control and restoration projects
• Illuminate juvenile fish outmigrant patterns; delineate adult fish migration

corridors
• Show contaminant loading fate and persistence from individual sources, as well as cumulative effects from multiple sources
• Ability to conduct long-term simulation including effect of climate change
• Assess impact/feasibility of extracting tidal energy from Puget Sound

From: Tom Miller

Date: 05/08/2008

Comment: I have attached 3 pictures of stormwater runoff going into the waters on the west side of Point Roberts. Besides the potential toxic pollution, this water could be routed to the local golf course and with minimum treatment be used to irrigate.
We are currently buying water from British Columbia and this could go a long way towards making us self sufficient.
The Water Board recently submitted an application for Comprehensive General Plan approval and this was rejected by the State due to the lack of any plan for conservation.
To make matters worse, they are about to spend millions installing a new storage facility which is totally unnecessary if simple state-of-the-art conservation methods were instituted.
I have tried several times to bring this to the attention of PSP and have yet to have my e-mails answered.
Could you please provide a contact for further discussions.

Attached photos: IMG_0066, IMG_0064, IMG_0065

From: Susan Saffery

Date: 05/08/2008

Comment: We appreciate the opportunity to participate in the process of developing the Puget Sound Partnership Action Agenda. This document reflects the comments of professional staff with scientific, policy and programmatic expertise in this subject matter. While these comments are not "official City policy" per se, they do reflect the respected opinions of key staff from Seattle Public Utilities and Seattle City Light. In addition to these written comments, staff from both Seattle Public Utilities and Seattle City Light participated in the topic forum discussions directly. Comments made during those discussions stand alone and so are not necessarily reflected in these written comments. In reviewing our comments, please feel free to contact me if you have any questions, need clarification or would like more

information.

1. Sediment Phthalate Work Group. The findings and recommendations of the Sediment Phthalate Work Group should be considered by the Puget Sound Partnership (PSP) and integrated, as appropriate, into the action agenda. The Work Group synthesized and evaluated available technical information related to the causes of and potential approaches to addressing recontamination by phthalates at sediment cleanup sites. The information evaluated indicated that the majority of phthalates that find their way to sediment follow the air-storm water-sediment pathway. What was learned and summarized by the Work Group regarding this pathway is likely relevant for understanding other chemicals of concern that behave similarly (e.g., PBDEs) and guiding additional studies or evaluations. The Work Group consisted of representatives of the Cities of Seattle and Tacoma, King County, U.S. EPA, and the Washington State Department of Ecology and the group's activities are documented at:
http://www.ecy.wa.gov/programs/tcp/smu/phthalates/phthalates_hp.htm

2. Baseline or Current Conditions. The importance of establishing baseline conditions for both water and sediment quality can't be overemphasized. Without a good baseline (including a better understanding of the rates of natural recovery in sediments at priority areas), the effectiveness of actions will be difficult or impossible to evaluate. Deciding whether the existing database for water and sediment quality together with ongoing regional monitoring programs is enough to establish a baseline needs to be a high priority. This evaluation should address both the area and density of coverage and the list of constituents evaluated. Although potentially challenging and time consuming, at least a basic assessment should be made of what baseline data are needed to generate statistically meaningful effectiveness measures.

3. Desired Future Conditions. Identifying what are desired future conditions (DFCs) for water and sediment quality is an important exercise for the PSP to undertake early in the process. For example, for sediment quality, are the DFCs cast to simply meet existing regulatory criteria? Or, are there non-regulatory goals or more stringent thresholds that are relevant? The elements of the action agenda for water and sediment quality should be driven, at least in part, by the results of a DFC analysis.

4. Programmatic Evaluation of Effectiveness. Municipalities and other entities have been and are engaged in many different activities intended, at least in part, to improve surface water and sediment quality (for example, low impact development, stormwater treatment, source control, etc.). The

information available on the scope and effectiveness of these activities should be assembled and carefully assessed. A possible approach for this assessment is to identify and develop a series of Puget Sound-focused "white papers" or summary documents on these various activities that objectively evaluate effectiveness and applicability. Although the PSP is focused on action, this would seem to be an important programmatic step to maximize focus on what actions give the most "bang-for-the-buck".

5. Pilot Projects. Improving water and sediment quality is a long-term endeavor, which the time table of the PSP Action Agenda acknowledges. One of the challenges of such an endeavor is that many of the large-scale programs that are ultimately implemented by the PSP may require many years of monitoring to generate results that are measurable. It seems useful to identify existing projects or projects that can be implemented confidently early on that will generate useful information on a schedule that can then feed back into the action agenda and guide more comprehensive projects. This would increase the overall chances of success. For example, there may be sub-basins in which promising actions could be (or may already be) implemented quickly and generate useful results. There are many potential actions that could be involved in such a pilot project. The thrust of this comment is for the PSP to identify now what types of actions might be most appropriate for a pilot project to assess and where the pilot project(s) would best be implemented.

6. Population Policies. Population growth in the Puget Sound Basin is a root cause of many of the water quality and sediment quality problems we face. Continued population growth and attendant development has the potential to offset the potential gains made through the various management actions being considered. Projected population growth and its effects should be qualitatively and quantitatively discussed and brought to the forefront in conversations with the public and policy makers. This will inform both the strategies pursued by the Partnership and the broader conversation on population growth, land use, and quality of life.

7. CSO Program Limitations (P1 B). Progress made to date on controlling CSOs is significant and should be briefly summarized. In many areas, the remaining CSO volumes are a small fraction of their historic volumes. Further progess on the control of CSOs will involve choices between significant capital investments, operational and management controls and technologies, and most likely a balancing of these strategies. A clear assessment of the environmental, social and financial benefits and costs of these choices is likely to be very important for Puget Sound recovery, and may, in some cases, suggest a better use of dollars to achieve a faster or

more effective recovery of Puget Sound. The ability to shift dollars between investments given regulatory regimes is difficult, even if advisable in some cases, and when viewed from the scale of Puget Sound recovery.

8. Regulatory Strategies (P2 C). 1) Programs to reduce and discourage fertilizer/pesticide application to lawns, landscaped areas, transmission corridors, etc. should be considered. 2) Programs to prohibit or discourage use of known toxics that affect water quality or sediment quality should be considered. State taxes, product bans, public education programs, rebate incentives, etc. may be useful tools. Identification and prioritization of products with direct impacts would be essential to this effort.

9. Regulatory Strategies (P2 C). A section on sediments should be added, including strategies for dredged material management. Strategies for rapid improvement of sediment quality could include: 1) accelerated cleanup of known contaminated sediment sites; and 2) programs for use of clean dredged material for enhanced natural recovery. The latter strategy could be implemented inexpensively as an interim or final cleanup action over large areas, and would require coordination between the DMMO, USACE maintenance dredging, and CERCLA and MTCA programs.

10. Seattle Public Utilities' (SPU) recent street sweeping pilot study. SPU recently completed a pilot street sweeping study during which three neighborhoods were swept once every other week for 12 months by a high efficiency regenerative air sweeper. Some cities in other states operate regenerative air sweepers in order to reduce pollution to downstream receiving water bodies. Such sweepers use this relatively new technology, which is very effective at collecting and disposing of pollutants which bond to microscopic (<60 microns in diameter) particles. Many of these pollutants (copper, lead, zinc, etc.) are toxic to aquatic life and water-soluble, so there is a pollution prevention benefit to removing them before they enter the drainage system. This is an effort we'd like to see PSP support and perhaps encourage replication in other jurisdictions around the Sound. Overall study conclusions include:
a) Street sweeping prevents a significant amount of sediment and associated contaminants from being discharged to receiving waters.
b) Street sweeping is likely to be a cost competitive option for managing stormwater pollutant removal.
c) Catch basins provide minimal stormwater quality treatment when compared to street sweeping.
d) The effectiveness of street sweeping at removing pollutants is likely dependent upon the existence of street curbing and the lack of parked cars in the pathway of the sweeper on sweeping days.

11. Wastewater S2 A. p. 18. The statement “Most larger facilities are operated to remove some nutrients, primarily nitrogen,..” may be true generally but does not apply to the two largest POTWs in the Puget Sound area, KC South Plant and KC West Point. These facilities do not substantially remove nitrogen in their treatment processes. This may result in a gap in understanding concerning the relative ranking of total nitrogen loadings from point and non-point sources.

12. Wastewater P1 p. 24. The reuse of treated wastewater has been developed as an alternative to marine and freshwater discharge. In the majority of cases, reclaimed water does not serve as an alternative to discharge especially in the Puget Sound area with low demand for reclaimed water.

13. Water Supply Planning. Water supply planning is not required to include reuse as a significant component. Nonpotable demand is not adequately accounted for as a separate demand in water supply planning. This is not correct, WSP are required to evaluate reclaimed water as a potential source.

14. Clean Water Act. There is a need to address additional sections of the Clean Water Act as they provided both regulatory and non-regulatory tools for PS protection. Specifically, section 404 which regulates the placement of dredged or fill material in all waters of the US; Section 319 which addresses non-point source pollution (the State has a federally approved non-point source management plan which contains milestones and measures of success and is updated periodically); Section 320 which deals with national estuaries (PS in one),this section requires an estuary management plan which contains milestones and measures of success (PS has one which is updated periodically).

15. Understanding Existing Work. The PSP needs to synopsize and evaluate the plethora of activities occurring in the PS basin. It is important to understand who is doing what, what is working, what is not so that they can decide what to support and promote and where they need to fill in gaps. They REALLY need to start there; we don't want to reinvent anything.

16. Engage the Private Sector. PSP needs to engage the private sector in a big way. This will require a dedicated staff person (at least one) who can reach out and help create a structure that will allow meaningful participation of the business community. This will require the active involvement of the Governor, the Leadership Committee, lead PSP staff and our members of Congress.. There is a model for this in Coastal America's Corporate

Wetlands Restoration Partnership.

17. Learn from Other Efforts. Look at other models (Great Lakes, Chesapeake Bay, Gulf Coast) and consider creating a PS office here. This could be federal or Federal/State. The function of that office would be to bring together all relevant Federal (or Federal/State) partners for the purpose of helping with the implemenation the Action Agenda. It would allow the various agencies to bring their separate funding mechanisms and technical expertise to bear on PS protection and recovery in a coordinated fashion. Such an entity could also receive separate federal funding.

18. Water Resources. A principle of turning stormwater and wastewater into water resources is one that we can support. However, it has to be done at a reasonable cost to the citizens of the region. Consequently, the principle statement about this needs to be tempered with language such as "where cost-effective." Saying wherever possible, implies at any cost. Reclaimed water is treated as a comprehensive solution without allowing the appropriate level of analysis to determine if it is the right solution for the problem. The report identifies the triple bottom line analysis of reclaimed wastewater compared to other alternatives has not been conducted. That must be done before proscribing it as a solution, and recognize that its practical application will vary by location.

19. Nutrient Loading. In the strategies section under wastewater, the solution to reduce nutrient loadings is proscribed. Why not focus on setting nutrient reduction goals/targets/or requirements, and allow the local jurisdiction to figure out the best solution. Overall, focus on the benefits to achieve, not the methods.

20. Land Use. The land use section of strategies is very important and could benefit from more content. There should be attention paid to the direct link regarding to the significance of land use planning, controls and permitting as a way of improving water quality in Puget Sound. Water supply has been the inappropriate target of fixes since it is thought to be easier, when land use commonly ignored.

21. Research on Stormwater. Strongly support in situ field research on the ecological effects of stormwater, a topic which is much talked about, but little studied and understood. Most water quality experts and hydrologists are not ecologists and few ecologists are experts on stormwater quality and hydrology, and the disciplines are infrequently integrated. Yet the Puget Sound region is spending 10's of millions of dollars to improve stormwater quality, but we are uncertain of the key specific water quality and

hydrological thresholds that need to be reached to improve the health of aquatic biota.

From: Ron Shultz

Date: 05/08/2008

Comment: Attached you will find comments to the Partnership's "Water Quality Topic Forum" paper provided by the Washington Conservation Commission and the Puget Sound Conservation Districts.

May 6, 2008

The twelve Conservation Districts in the Puget Sound basin have had an opportunity to review the Partnership's "Water Quality Topic Forum" paper and would like to provide the comments listed below.

If you have any questions, please feel free to contact me.

Conservation Commission and Puget Sound Conservation District
Comments to the Partnership's Paper "Water Quality Topic Forum"

With the expansion of the area of authority for the Partnership from only the marine waters to the entire basin, water quality concerns also expand to include factors that previously were not addressed. These include sediments (as inputs to fresh and marine water from soil disruption activities, rather than the quality of the sediments themselves), temperature, pH, and other water quality parameters found in the Ecology 303(d) water quality assessment program.
Although the paper mentions that "there have been an increasing number of impaired water body listings on the State's 303(d) lists…" there is no detail provided on these listings. The department Ecology recently released a proposed 303(d) list for 2008, sorted by Puget Sound Partnership Action Area. This information should be included in this paper since it provides a convenient snapshot of the inputs to freshwater systems around the Sound. See Appendix 1 below for a suggested approach. Although there are criticisms of the 303(d) list as a reliable indicator of water quality problems, if there are weaknesses in the program the paper should acknowledge and recognize those weaknesses, and make recommendations on how the 303(d) program could be improved to more accurately characterize water quality conditions in the Puget Sound basin.

The current Water Quality Topic Paper has no discussion of sediment inputs

from soil disruption. Sediment is a key limiting factor for salmonid reproduction because fine silts can cover gravels in streams. There is a significant amount of literature in this area that the Partnership should incorporate in this paper. Inclusion of a discussion of sediment inputs is important because it would lead to a discussion of management programs that are in place to address this issue. The Topic Paper fails to mention regulatory programs that address sediment inputs, including the state Forest Practices Act and local clearing and grading ordinances.

In the section "Science Question 2: Management Approaches Addressing Water Quality", there is no discussion of the Ecology TMDL process. TMDLs, or water cleanup plans, describe the type, amount and sources of water pollution in a particular water body, they analyze how much the pollution needs to be reduced or eliminated to meet water quality standards, and they provide targets and strategies to control the pollution. As such, this program should be described as a critical management approach to addressing water quality impairments.

In the subsection titled "Interface with small agricultural and landscape operators" we would recommend the following be included:

The Conservation Reserve Enhancement Program, or CREP, implemented by local conservation districts with financial support from the state Conservation Commission, provides landowners with technical resources and financial assistance to install best management practices to improve stream buffers that will reduce sediment, bacterial and nutrient pollution, and eventually reduce stream temperatures by shading, while restoring other important stream conditions. A recent report on the effectiveness of CREP buffers found that in western Washington, plant survival in CREP restoration sites was 92.6%.

The section under "Policy Approaches to Address Water Quality in Puget Sound" titled "Existing regulatory or management programs" doesn't mention the state Forest Practices Act or local clearing and grading ordinances. These two regulatory programs play a key role in preventing sediment delivery into fresh and marine waters.

In this same section, under the category "Wastewater", there is no discussion of the current regulatory structure for on-site septic systems between the state departments of Health and Ecology, and local health districts. These entities are referred to in the next section – "Limitations of existing programs" – but the "limitations" should play off of the programs identified in the first section.

Policy Question 1 "Policy Approaches to Address Water Quality in Puget Sound", should be divided into two subsections, the first covering regulatory programs and the second discussing incentive programs. This is the approach used in the Land Use/Habitat Focus Paper and it seems to be a better way to identify and discuss the current approaches to addressing these issues. Furthermore, this section does not discuss any incentive and non-regulatory programs to address water quality.

Although the current paper briefly mentions the current work of the conservation districts and the state Conservation Commission, there is no description of the programs offered by the districts. This work is also identified in the "stormwater" section, when it would be more accurate to capture them in a new subcategory of incentive based actions. Some suggested language:

[New Subsection under P1] Influencing Human Activities: Incentives, Education, Stewardship and Restoration Programs

The 12 conservation districts in the Puget Sound basin implement a number of incentive based programs for landowners to reduce inputs into fresh and marine waters. Supported by funding from the state Conservation Commission, local assessments, federal grants, and other sources, districts implement the following programs that support the protection of fresh and marine waters:

Livestock Grants: The Washington State Legislature appropriates funding to WSCC to distribute Livestock Grants to conservation districts. The Livestock Grant is used to assist owners and operators of animal feeding operations in developing nutrient management plans as well as providing information to smaller scale livestock producers. In addition, the Livestock Grant provides cost-share funding for implementation of Best Management Practices (BMP's) such as roof runoff management, livestock exclusion fencing, and manure management facilities.

Conservation Resource Enhancement Program (CREP): WSCC administers CREP to provide funding for private landowners who enroll land located along water bodies with priority salmonid stocks. Eligible land is planted – and where necessary, and fenced – to create forested streamside buffers that are protected for 10-15 years, providing cooler streams, more diverse aquatic habitats, and a reduction in sediments. Participants are reimbursed for 100% of eligible costs and receive an annual rental payment per acre enrolled. FSA provides 80% of the funding for CREP.

Farm Plan Implementation Grant (FPIG): WSCC administers FPIG funding, appropriated by the Legislature, to conservation districts in Washington State. Based on local long-range and annual planning, districts use the funding to conduct outreach activities, provide technical and financial assistance for BMP implementation, participate in watershed planning, and coordinate water quality monitoring activities.

Districts also engage in water quality monitoring, projects for shoreline erosion protection, stormwater management and LID planning, land and water stewardship education, forestry management planning with landowners, and coordinate volunteer monitoring.

In the section "Strategies to Improve Water Quality" there is no discussion of improvements to incentive programs. Although incentive programs can, and do, provide an effective method of addressing inputs to the fresh and marine waters of Puget Sound, these programs could be improved. The programs could be more targeted to focus on areas where monitoring indicates there are specific problems. For example, the incentive programs implemented by the Commission and the Districts are currently very opportunistic in nature – assistance is provided to landowners who request is. But there may be an opportunity for Districts to target outreach to landowners in areas where a river segment is listed on Ecology's 303(d) list.

APPENDIX 1 – Suggest Approach to Identifying Ecology's Proposed 303(d) Listings for Puget Sound Action Areas.
Water Quality 303(d) Listing by Puget Sound Partnership Action Areas
Category 2 – Waters of Concern
This category applies when some credible data create concerns of possible impact to designated uses, but fall short of demonstrating that there is a persistent problem. This category is intended to help Ecology and the public be aware of, track, and investigate these water quality concerns. Opportunities should be pursued to conduct additional monitoring and sampling, incorporate the water body into existing studies, or find other means to confirm (and correct) or refute the suspected problem.

Category 4 – Impaired But Does Not Require a TMDL
This category acknowledges those water body segments which are impaired but are not appropriate for listing in Category 5 because:
• EPA has approved the TMDL for the specified pollutant(s);
• An effective clean-up project other than a TMDL is already in place; or
• The impairment is not known to be caused by a pollutant, and therefore a TMDL is not appropriate to address the impairment.

Category 5. 303(d) List Impaired by a Pollutant and a TMDL is Needed
Water body segments impaired by a pollutant will be placed in this category and will be submitted to EPA as the 303(d) list. For waters expected not to meet applicable water quality standards, listing will need to be based on trend information showing that, while they currently meet standards, they are likely to be impaired by the next assessment cycle.

Sources:
Category Definitions: Department of Ecology, Water Quality Program Policy 1-11, Assessment of Wter Quality for the Clean Water Act Sections 303(d) and 305(b) Integrated Report, September 2006.
Action Area Listing: Department of Ecology, Proposed 2008 Water Quality Assessment, April 16, 2008.

Category 2 Category 4 Category 5
North Central
Dissolved Oxygen 11 50
Fecal Coliform 12 1 27
pH 24 12
Temperature

San Juan Islands
Dissolved Oxygen 11
Fecal Coliform 2 6
pH
Temperature

South Central
Dissolved Oxygen 4 2
Fecal Coliform
pH
Temperature 1 6 2

South Puget Sound
Dissolved Oxygen 1 4
Fecal Coliform 25 4 27
pH 1
Temperature 1 7

Whidbey Island
Dissolved Oxygen 5

Fecal Coliform 2 1 4
pH
Temperature

Strait of Juan de Fuca
Dissolved Oxygen
Fecal Coliform
pH
Temperature

Hood Canal
Dissolved Oxygen 4
Fecal Coliform 13 9
pH 2 1
Temperature

From: Tami Ishler

Date: 05/08/2008

Comment: Please find attached the Department of Natural Resources comments on the Puget Sound Partnership Topic Forums. A hard copy will follow in the mail.

General comments by the Department of Natural Resources
Aquatic Resources Division and Forest Practices Division on
Puget Sound Partnership Topic Forums

Aquatic Resource Division Comments

The Department of Natural Resources (DNR) appreciates the opportunity to comment on the Topic Forums presented by the Puget Sound Partnership. We recognize the papers prepared by the Partnership were intended to elicit comment and are not meant to be definitive statements by their authors on the subject topic. While we are impressed by the volume of work that was completed in a short time frame in the Topic Forums, we view them only as first steps. A significant amount of additional work is needed to adequately summarize the state of the resources, assess the effectiveness of existing management tools, and to identify actions. These general comments and the attached forum specific comments are provided with that understanding and with the intent that they will strengthen the work of the Partnership in its effort to restore a healthy Puget Sound by 2020.
We remind the Partnership that DNR has a unique and central role as the manager of extensive terrestrial and aquatic lands with a diverse set of both

regulatory and proprietary tools. Nearly all the marine and freshwater bedlands in Puget Sound remain in state ownership and are managed by DNR. DNR Aquatics staff believe there are potential synergies from working with DNR and utilizing its proprietary authority to help protect and restore the Sound. Accordingly, forum papers, especially the habitat topic, need to consider and integrate DNR's land management role more fully in order to effectively lead restoration of Puget Sound.

The topic forums suffer from artificial limitations placed on the scope of the topic. For example, an analysis of habitat status, threats and priority actions that omits water quality is fundamentally incomplete. This limitation will be a major challenge for the Partnership to address in the cross-topic synthesis workshop especially since it will be the only identified opportunity to discuss Human Quality of Life, a topic of central interest. Human Quality of Life is critical to integrate since a significant challenge for the Partnership is to identify how the region can balance environmental needs with human well being.
Balancing how best to accommodate increased population growth and economic development with improvements to the health of Puget Sound will be difficult to achieve. The aggressive schedule for completing the Action Agenda and its supporting documents should help build public interest and their consequent buy-in to actions and needed resources. However, the Partnership must increase efforts to maintain clear objectivity in its written products so citizens, agencies and organizations will engage in the Partnership's work.

Additionally, accountability and responsiveness should be a critical component of the forthcoming Action Agenda. To that end, monitoring programs should be established to assess the effectiveness of management efforts and whether those efforts are in compliance with the applicable laws, rules and management guidelines.

Forest Practices Division Comments

Major concerns we have with the "Initial Discussion Draft Land Use/Habitat Protection And Restoration Topic Forum" (Forum) include the following.

1. The Forum's Preliminary Policy Recommendations call for "at state-level a single, integrated, set of regulations that apply in [sic] to the lands, streams and marine areas within Puget Sound to replace our present fragmented system of regulations." We are concerned that this recommendation may be inconsistent with RCW 90.71.360, which specifies,

No action of the partnership may alter the forest practices rules adopted pursuant to chapter 76.09 RCW, or any associated habitat conservation plan. Any changes in forest practices identified by the processes established in this chapter as necessary to fully recover the health of Puget Sound by 2020 may only be realized through the processes established in RCW 76.09.370 and other designated processes established in Title 76 RCW.

As you know, Washington's Forest Practices Act and Rules are built on a foundation of collaboration among the State, Indian Tribes, forest landowners, federal agencies, and others concerned with Washington's private and state forests. This foundation traces back over 20 years to the 1987 Timber, Fish & Wildlife Agreement (TFW). A call to wholesale replace our current system of regulation would be of great concern, for diverse reasons, to the caucuses that have worked together so hard, for so long, in the spirit of TFW and later, Forests & Fish. Any departure from our current system of regulation also could jeopardize the State's Forest Practices Habitat Conservation Plan, a 50-year agreement implemented in 2005 by the State, U.S. Department of Commerce / National Marine Fisheries Service, and U.S. Department of the Interior / U.S. Fish & Wildlife Service.

2. The Forum appears to assume that the Forest Practices Act and Rules were last updated in 1987 ("Updates to the FPA were added in 1987, as a result of the 'Timber, Fish and Wildlife' negotiations ..."). No mention is made of Washington's 1999 Forests & Fish Report, which was subsequently enacted into law by the legislature, then translated into major revisions to the Forest Practices Rules adopted by the Washington State Forest Practices Board (Board) in 2001. We are concerned that the Forum's perspective on the Act and Rules may be skewed, as it appears to assume that 2008 levels of public resource protection are the same as those that existed 20 years ago.

This "1987" perspective is again reflected in the statement, "The [1987] update also failed to address issues relating to small forest landowners (mainly those with parcels smaller than 20 acres in size)." As part of the 2001 rule changes, and since that time, several initiatives have been implemented to help maintain the viability of small forest landowners. These include the Forestry Riparian Easement Program, changes to road maintenance and abandonment plan requirements, the Family Forest Fish Passage Program, and long-term (up to 15-year) forest practices approvals.

3. The Forum overlooks the existence of the Forest Practices Adaptive Management Program (AMP):

Monitoring and adaptive management programs are sparse in Puget Sound. Although good examples of programs do exist ... there are few regulatory programs that require their use. This is an area where a significant gap exists in management tools in Puget Sound.

The AMP is a requisite, integral part of the Forest Practices Rules. Its purpose is "to provide science-based recommendations and technical information to assist the board in determining if and when it is necessary or advisable to adjust rules and guidance for aquatic resources to achieve resource goals and objectives." Over $20 million in federal and state funding has been obtained over the past 8 years to implement dozens of scientific projects. Significant funding has been secured for the future; additional work is planned.

Time constraints prevent us from providing more detailed comments on the Forum at this time. We hope that the points noted above illustrate the need for increased interaction between the Partnership, DNR, and other organizations that are playing a leadership role in the conservation of Puget Sound's forest ecosystems.

Please let us know how the Forest Practices Program can best engage with the Partnership to accomplish the important work that is before us.

Forum-specific comments by DNR Aquatic Resources Division and Asset Management and Protection Division on Puget Sound Partnership Topic Forums

From: Jane Lamensdorf-Bucher

Date: 05/08/2008

Comment: Attached please find a cover letter from Theresa Jennings, Director of the King County Department of Natural Resources and Parks, and the following sets of comments on the Puget Sound Partnership topic forum discussion papers and risk analysis:

1) General Comments
2) Human Health
3) Land Use-Habitat
4) Water Quality
5) Species-Biodiversity
6) Water Quantity

7) Risk Analysis

We are also sending a hard copy to your attention at the Puget Sound Partnership address in Olympia.

see PDFS:
cover ltr to MNeuman from TJennings re comments.pdf
KC General Comments pdf
KC HumanHealth Comments pdf
KC LandUse-Habitat Comments pdf
KC Water Quality Comments pdf
KC Species-Biodiversity Comments pdf
KC Water Quantity Comments pdf
KC Comments on Risk Analysis pdf

From: Stewart Toshach

Date: 05/08/2008

Comment: Please forward attached comments/analysis to appropriate people in the Partnership or Science Panel.

See document:
PSP Topic Forums_data needs_2008-05-07.doc

From: Heather Trim

Date: 05/07/2008

Comment: RE: Initial Discussion Draft Water Quality Topic Forum White Paper – Science Question One

We are writing to comment on Initial Discussion Draft Water Quality Topic Forum white paper, dated April 14, 2008. We will refer to this document as the "WQ Paper" for the remainder of the comments.

People For Puget Sound is a nonprofit, citizens' organization whose mission is to protect and restore Puget Sound and the Northwest Straits.

The Puget Sound Environmental Caucus, which includes People For Puget

Sound, is submitting comments that focus on management actions – status, gaps and needs, including needed regulatory changes.

In this letter, People For Puget Sound is focusing on the first science question in the document: Science Question 1 (S1): Status of Water Quality in Puget Sound. We have been participating in the Indicator development effort and we therefore are looking at this portion of the WQ Paper from that point of view.

In summary, we suggest that the WQ Paper be re-organized to match the Indicator Group's Water Quality Conceptual Model, that these components be carried through to the Policy Questions, and that more summary information be added to the Paper, such as tables that summarize chemicals of concern.

Reorganization
For clarity and completeness, we suggest that the S1 Section of the WQ Paper be reorganized to the following framework as is outlined in the conceptual model developed by the team of scientists working with Sandie O'Neill and Tracy Collier (The Provisional Indicators Workgroup) in this order:
• Sources: Currently mixed with pathways in the section titled: "Sources and pathways for nutrients, pathogens, and toxics entering Puget Sound
• water bodies"
• Pathway: See above
• State and Impacts: Currently section titled: "Documented threats to fresh water and marine water quality in Puget Sound."
• Management Response: Science Question #2, Policy Questions #1 and #2

Each class of pollutant can be considered within this framework. Below, we offer comments within this framework suggestion along with some cited statements of current conditions. We primarily used the sources that are listed in the Water Quality Conceptual Models. The current structure of the WQ Paper leaves out many pollutant sources and pollutants. We suggest that the remainder of the paper cover the policy questions related to each of the pollutant sources and pathways in a similar systematic manner so as to highlight which are addressed and which are partially or inadequately addressed.

Additions

We suggest that a discussion of Natural Drivers be should be separated out into its own section of the WQ Paper. This section could include a brief

discussion of how natural processes influence pollution conditions, such as the role of wind in areas with dissolved oxygen problems.

In addition, we suggest that the WQ Paper include more tables and charts that show the chemicals of concern, effects, types of sources, etc. One example is shown in Attachment 1 - Sources of Air Pollutants of Concern to Great Waters and Coastal Areas. Another example is use of the information from the Ecology-led Toxics Loading Assessment Phase I (completed in November 2007). While imperfect, the Assessment document lists the relative loads of 15 individual or families of toxic chemicals of concern to Puget Sound. A great deal of discussion and thought went into choosing those chemicals. A table showing this list of chemicals, including their toxic effects on wildlife, could be included in the WQ Paper as an important starting point for discussion. Further, the relative loads of these chemicals in 10 pathways should be included in a table in the WQ Paper in order to give readers a relative sense of the problems we face. We look forward to the results of Phase I and Phase III studies, but in the meantime, the Phase I results form a credible basis for discussing toxic chemicals of concern.

Suggested Framework
We didn't have time during this short public comment period to fully comment on each component below but offer examples of referenced statements that could be added to some of the Source or Pathway components as well as a listing of references that could be used for the State and Impacts section.

A. Sources
Industrial processes/Power Plants
In this section, we suggest a that the WQ Paper include a brief discussion of the numbers of, distribution of and pollutants associated with the industrial facilities in the Puget Sound Basin. An easy starting point would be EPA's TRI (Toxic Release Inventory) database and Ecology's permit database. The most recent (2006) TRI reporting facilities are compiled in Attachment 2. Their reported 2006 toxic chemical release (air, surface water, injection, land) totaled 16,069,795 pounds. This total load is significantly lower than the offsite transmittal of toxic chemicals to sanitary sewers or to landfills which could also be compiled.

Vehicles
• Emissions and oil drip.
• Brake pads.
• Wheel weights.
• Tire wear. Tire wear is a significant source of metals. Tires contain arsenic,

cadmium, nickel, zinc, mercury, chromium, and zinc as well as a suite of organic chemicals. New automobile tires weigh 25 pounds while scrap tires weigh 20 pounds; new truck tires weigh 120 pounds, scrap tires 100 pounds.
• Resuspension. One of the most significant sources of pollutants to the atmosphere and potentially to waterbodies are due to the resuspension of particles due to movement of vehicles on roadways contributing metals such as chromium, copper, lead, nickel and zinc.

Marine vessels
• Recreational boats.
• Container Ships, Tankers and other large vessels.
o Oil.
o Ballast. A good summary of ballast problems, including number of ships arriving in Puget Sound and ports of origin, ballast volumes (average of 8 million cubic meters of ballast), and critical locations was presented by Kevin Anderson of the Puget Sound Action Team. Significant additional work on this topic has been conducted by Ecology.
• Cruise Ships
• Maritime-associated air emissions. The Ports of Seattle, Tacoma and Vancouver BC recently completed an excellent inventory of maritime-related emissions with a focus on diesel and greenhouse gas emissions. Toxic chemical loadings can be calculated from Appendix D.

Marinas/Boathouses
• Wastes
• Paint and maintenance operations

Other transportation: rail, air
• Airplane-related
o De-icers.
o Jet emissions
• Rail
o Idling.
o Yards/Transfer Operations.

Accidental spills (land-based)

Mining

Forest Practices

Agricultural
• Biosolids use in agriculture/forestry. 70% of the antibiotic triclocarban

persists in Biosolids after treatment
• Fertilizers.
• Pesticides. In a study of pesticides from agricultural lands in the Yakima area from 2003-2005, the most frequently detected herbicides were 2, 4-D, bromacil and terbacil, atrazine, and diuron and most common insecticides were chlorpyrifos, malathion and azinphos.
• Animal Wastes. 90% of the estrogen load is animal manure from concentrated animal-feeding operations (CAFOs). These estrogens, as well as those from human sources, are shown to be the most potent endocrine disrupters in aquatic environments.

Pesticide use in homes, schools, landscaping
• Outdoor use in urban areas. In urban areas, Pentachlorophenol, a wood preserver, is used in large enough quantities and persists to the extent that it shows up in creeks. In addition to pentachlorophenol, other most frequently detected compounds as shown in a 2003-2005 urban study (Thornton Creek) are herbicides triclopyr, dichlobenil and MCPP and the insecticide diazinon.

Aquatic pesticides applied directly to waterbodies

Home Wood Stoves and Trash Burning

Building materials
• Roofing, gutter materials
• Vinyl siding
• Coatings
• Asphalt paving

Consumer products (used in homes, offices, industry, etc)
Chemicals such as polybrominated diphenyl ether (PBDE) flame retardants, PFOAs, phthalates, other organic chemicals and metals in consumer products off-gas or are eroded from the products and adsorb onto particulates in air or onto dust.

• PBDE example. PBDEs are found in common foamed or textile products such as upholstery, carpet padding and padded dashboards and in electronics plastics such as computer and television housings. PBDEs volatilize into the air and attach to dust, although the exact mechanism is unknown. Recent studies show that higher levels are found in Americans compared to Europeans and that some populations have much higher levels than others (“super highly exposed people”) which is believed to be reflective of varying concentrations in households. A portion of this dust is ingested. In addition to human sewage, additional pathways to the Sound may be indoor-outdoor

air exchange, or through sewage via household laundering and cleaning processes.

Log Booming/Rafting

Existing Structures/Creosote pilings

Aquaculture
• Fish Pens
• Shellfish Growing Areas
• Hatcheries

Sewage
• Pharmaceuticals. In addition to reference listed in the WQ Paper, pharmaceuticals in Washington have also been studied in Sequim
• Drinking Water. Surface waters that are downriver from Sewage Treatment Plant Outfalls are used in at least two rivers for drinking water (Anacortes and Firnwood). Lake Whatcom, a major source of drinking water is severely impaired due to development pressures.

Leaking landfills.

Hazardous waste sites

Sediment Sites
• A listing and map of contaminated sediment sites in the Puget Sound Basin, including chemicals of concern would be helpful.

Soil Sites
• Rayonier Mill - which left dioxin in soils and in landfills in Port Angeles
• Everett Smelter - which left lead and arsenic in a footprint
• Asarco Smelter - which left a large areawide plume of lead and arsenic in soils from Tacoma northward

Military activities
• In-water Ordnance training in specified bays
• Other training exercises
• Construction and maintenance operations

Other?

Source Issues that should be listed as areas for further research:
• Additional Emerging Chemicals. Impacts of extremely persistent sugar

substitute Sucralose (a half-life in water of up to several years) on the environment is unknown. New studies show that a significant amount passes through sewage treatment plants.
• DNA impacts. New studies show that contaminates are causing changes in the DNA structure and cellular physiology of the livers and gills of English sole in lower Duwamish River .

B. Pathways

Aerial deposition
• Air is not routinely assessed on a cumulative basis in Washington. Further, the air toxics program has been measured by the amount of emissions reductions achieved as opposed to measured changes in air quality.
• A concern is that inorganic mercury from air and other sources is converted by bacteria to highly toxic methylmercury in oxygen-poor sediments in the bottom of wetlands, lakes, rivers and the Sound. This conversion process presents a significant complicating factor if we aim to create more salt marsh and nearshore habitat at the same time as we continue to allow significant sources of mercury in air emissions in our low lying industrialized areas.

Groundwater
• Groundwater associated with leaking landfills.
• Groundwater associated with hazardous waste sites.
• Groundwater associated with faulty septic systems.
• Seeps to Puget Sound. Seeps have been studied in detail as part of the Duwamish Superfund Site investigation.
• Seawater Intrusion. Seawater intrusion has begun to be a problem in some Puget Sound areas leading to salty water in domestic supplies, including Bainbridge. Although this issue may be discussed in the water resources issue, it should be also included in the WQ Paper in brief.

Surface Runoff

Stormwater
• Toxic chemicals. The WQ Paper unnecessarily focuses on the variability of stormwater data (on page 7) rather than the demonstrated need to address toxic chemicals in stormwater. In addition, the last paragraph on page 8 does not accurately reflect the conclusions and recommendations of Nat Sholtz's team's work.

Oil Spills

Contaminated Sediment Site Flux/Dredge Activity

Sewage Wastewater Point Discharges
• On page 9-10, the WQ document could be strengthened by a more robust discussion of the number of Sewage Treatment Plants that discharge to surface waters (103), the number that discharge to rivers and creeks versus directly into Puget Sound, an acknowledgement that many discharge into shallow waters, that Washington allows mixing zones for PBTs which allow for the discharge of toxic chemicals at acute levels near the outfalls, and the lack of data we have available about the bioaccumulation of toxic chemicals in organisms near outfalls.

Industrial Wastewater Point Discharges

Combine Sewer Overflows (CSOs)
• There are 10 CSOs systems in Puget Sound, primarily in older urban areas.
• On page 10, the WQ document incompletely describes the impacts of CSOs in Puget Sound: "Combined sewer overflows: Episodic discharge of a mixture of untreated wastewaters and stormwater from combined sewer overflow outfalls contributed relatively little to the total loading of toxic chemicals to Puget Sound (Hart Crowser et al., 2007)." Ample evidence shows the significant impacts of CSO discharges associated with legacy and ongoing pollution in urban bays.

Direct Contact (Creosote pilings, Ordinance Training)

Other?

C. State and Impact Status
For this section of the WQ Paper (in paper, this is the ""Documented threats to fresh water and marine water quality in Puget Sound" section) we suggest a number of other current references

• Pesticides in waterbodies. A 2003-2005 study examined the difference in pesticides in urban areas versus agriculture in Washington. A major study by U.S. Geological Survey examined pesticides detected in urban streams.

• Regional groundwater quality. USGS water research paper published in 2000 covered much of the Puget Sound region.

• Air in National Parks. Recent study examined toxic chemicals in snow, lichen, fish and alpine lakes associated with regional and local air pollution.

• Use of 305/303(d) List. Everywhere that this report is mentioned, it should

be qualified that the list is not based on representative data collection program and must be viewed as incomplete. On page 4, the statement, "There have been an increasing number of impaired water body listings on the State's 303(d) lists for temperature, fecal coliform bacteria, and dissolved oxygen in freshwater streams over the last 10 years," should be modified to indicate that the increase may be based on increased data collection and compilation.

• Shellfish Beds. On page 5, the discussion of closed shellfish beds should also include the status of all recreational areas as well.

• Biota. A major gap in the WQ Paper is a lack of discussion of biota endpoints. The topics that should be included range from orcas, otters and osprey, salmon and herring to benthic invertebrates. PCBs in fish in Lake Washington, PBDEs in salmon, osprey eggs, and fish kills in Hood Canal are other obvious subject areas. Sex altered fish in Elliott Bat should also be included.

Thank you for the opportunity to comment on the draft white paper. We would be pleased to provide references, if needed, for many of the components in the proposed framework that are left blank in this comment letter.

Attachments
Attachment 1
Sources of Air Pollutants of Concern to Great Waters and Coastal Areas
From: U. S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds; U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards. 2001. Frequently Asked Questions about Atmospheric Deposition: A Handbook for Watershed Managers. EPA-453/R-01-009
After: Third Report to Congress, 2000, Deposition of Air Pollutants to the Great Waters (U.S. EPA 2000).

Mercury and Compounds: Naturally occurring element often used in thermometers, electrical equipment (such as batteries and switching equipment), industrial control instruments, and industrial processes (e.g., Chlor-alkali plants). Released during combustion of fossil fuels (e.g., coal, oil); incineration of municipal, medical, and hazardous waste; and from numerous manufacturing and natural processes. Banned as a paint additive in U.S. in both interior (1990) and exterior (1991) paint. Being phased out of batteries. Removed from catalysts, turf products, and explosives.

Cadmium and Compounds: Naturally occurring element used in metals production processes, batteries, and solder. Often released during combustion of fossil fuels and waste oil, and during mining and smelting operations.

Lead and Compounds: Naturally occurring element historically used in gasoline and paint additives, and still used in storage batteries, solder, and ammunition. Released from many combustion and manufacturing processes and from motor vehicles. Use in paint additives restricted in U.S. in 1971. U.S. restrictions on use in gasoline additives began in 1973 and have continued through the present, with a major use reduction in the mid-1980s.

POMb (includes PAHs): Naturally occurring substances that are by-products of the incomplete
combustion of fossil fuels and plant and animal biomass (e.g., forest fires). Also, by-products from steel
and coke production and waste incineration.

Dioxins/Furans: By-products of combustion of organic material containing chlorine, chlorine bleaching
in pulp and paper manufacturing, and diesel-fueled vehicles. Also a contaminant in some pesticides.

Nitrogen Compounds: By-products of power generation, industrial, and motor vehicle fossil fuel
combustion processes (NOx). Also, compounds used in fertilizers and released from agricultural animal
manures (NH3).
PCBs: Industrial chemicals used widely in the U.S. from 1929 until 1978 for many purposes, such as
coolants and lubricants and in electrical equipment (e.g., transformers and capacitors). In the U.S.,
manufacture stopped in 1977 and uses were significantly restricted in 1979. Still used for some purposes
because of stability and heat resistance, and still present in certain electrical equipment used throughout the U.S.

Chlordane: Insecticide used widely in the 1970s and 1980s. All U.S. uses except termite control canceled in 1978; use for termite control voluntarily suspended in 1988. Use of existing stocks permitted.

DDT/DDE: Insecticide used widely from introduction in 1946 until

significantly restricted in U.S.
in 1972. Still used in other countries. Used in U.S. for agriculture and public health purposes only with special permits.
Dieldrin: Insecticide used widely after introduction in late 1940s. Used in U.S. for termite control from 1972 until registration voluntarily suspended in 1987.
Hexachlorobenzene: Fungicide used as seed protectant until 1985. By-product of chlorinated compound and pesticide manufacturing. Also a by-product of combustion of chlorine-containing materials. Present as a contaminant in some pesticides.
Hexachlorocyclohexane: Component of technical-HCH, an insecticide for which use is restricted in U.S., but which is used widely in other countries.
Lindane: An insecticide used on food crops and forests, and to control lice and scabies in livestock and humans. Currently used primarily in China, India, and Mexico. U.S. production stopped in 1977. Use was restricted in 1983; many uses are still registered, but are expected to be voluntarily discontinued in the future.
Toxaphene: Insecticide used widely on cotton

Attachment 2. Toxic Chemical Releases of Puget Sound Basin Facilities
Toxic Release Inventory (TRI) 2006
Total On- and Off-site Releases, including air emissions, surface discharge, injection, onsite landfills and land treatment. This table does not include offsite transport and discharge to sanitary sewers (which are much larger loads). These numbers should be considered minimum numbers as the TRI reporting thresholds are high and information is based on self-reporting.
Reference: http://www.epa.gov/tri
Categories # Facilities Chemicals Total Pounds in 2006
Aircraft Manufacturing
Other Aircraft Parts and Auxiliary Equipment Manufacturing 10 Certain Glycol Ethers
Chromium Compounds
Copper
Diethanolamine
Freon 113
Hydrogen Fluoride
Lead
Manganese
Manganese Compounds
Methanol
Methyl Isobutyl Ketone
Naphthalene
Nickel

Nitric Acid
Phenol
Tetrabromobisphenol A
Toluene 356,892
All Other Motor Vehicle Parts Manufacturing
Heavy Duty Truck Manufacturing
Overhead Traveling Crane, Hoist, and Monorail System Manufacturing 5
Certain Glycol Ethers
Ethylene Glycol
Lead
Manganese 37,680
Boat Building
Ship Building and Repairing 8 1,1-Dichloro-1-Fluoroethane
Diisocyanates
Dimethyl Phthalate
Dioxin And Dioxin-Like Compounds Methyl Methacrylate
Styrene
Toluene
Xylene (Mixed Isomers) 310,717
Concrete Pipe Manufacturing
Cement Manufacturing
Ready-Mix Concrete Manufacturing 9 Dioxin And Dioxin-Like Compounds
Lead
Lead Compounds
Manganese Compounds Mercury Compounds
Nitrate Compounds
Polycyclic Aromatic Compounds
Zinc Compounds 761
All Other Basic Inorganic Chemical Manufacturing
All Other Miscellaneous Chemical Product and Preparation Manufacturing
Carbon and Graphite Product Manufacturing
Other Chemical and Allied Products Merchant Wholesalers 5 Di(2-Ethylhexyl) Phthalate
Ethylene Glycol
Lead
Lead Compounds Mercury
Methanol
Nitric Acid
Sulfuric Acid
Tetrachloroethylene 190,913
Bare Printed Circuit Board Manufacturing
Dental Equipment and Supplies Manufacturing
Printed Circuit Assembly (Electronic Assembly) Manufacturing

Switchgear and Switchboard Apparatus Manufacturing
Telephone Apparatus Manufacturing /Other Communications Equipment Manufacturing 9 Ammonia
Copper
Formaldehyde
Lead
Lead Compounds
Nitrate Compounds 11,226
Creamery Butter Manufacturing
Dry, Condensed, and Evaporated Dairy Product Manufacturing
Fats and Oils Refining and Blending
Fluid Milk Manufacturing
Soap and Other Detergent Manufacturing 5 Certain Glycol Ethers
Methanol
Nitrate Compounds
Nitric Acid 2,560
Brick and Structural Clay Tile Manufacturing 1 Hydrogen Fluoride 51,574
Hazardous Waste Treatment and Disposal
Solid Waste Collection/Hazardous Waste Collection / Other Nonhazardous Waste Treatment and Disposal
Specialized Freight (except Used Goods) Trucking, Local /Specialized Freight (except Used Goods) Trucking, Long-Distance /Hazardous Waste Collection 5 1,2-Dichloroethane
Acetonitrile
Barium
Benzene
Chloroform
Chromium
Copper
Copper Compounds
Cyclohexane
Dichloromethane
Ethylbenzene
Ethylene Glycol
Lead
Lead Compounds Mercury
Methanol
Methyl Isobutyl Ketone
N,N-Dimethylformamide
N-Butyl Alcohol
N-Hexane
Nickel Compounds
Nitric Acid

N-Methyl-2-Pyrrolidone
Pyridine
Silver
Toluene
Triethylamine
Xylene (Mixed Isomers) 256,669
All Other Miscellaneous Fabricated Metal Product Manufacturing
Electroplating, Plating, Polishing, Anodizing, and Coloring
Fabricated Pipe and Pipe Fitting Manufacturing
Finishing
Iron and Steel Forging
Iron and Steel Pipe and Tube Manufacturing from Purchased Steel /Fabricated Pipe and Pipe Fitting Manufacturing
Metal Can Manufacturing
Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
Other Nonferrous Foundries (except Die-Casting)
Plate Work Manufacturing
Primary Aluminum Production
Rolled Steel Shape Manufacturing
Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
Sheet Metal Work Manufacturing / Other Aircraft Parts and Auxiliary Equipment Manufacturing
Steel Foundries (except Investment)
Steel Investment Foundries /Machine Shops /Metal Heat Treating
Steel Wire Drawing 26 Aluminum (Fume Or Dust)
Antimony
Benzo(G,H,I)Perylene
Carbonyl Sulfide
Certain Glycol Ethers
Chromium
Chromium Compounds
Copper
Copper Compounds
Hydrochloric Acid
Hydrogen Fluoride
Lead
Lead Compounds Manganese
Manganese Compounds
Mercury
Mercury Compounds
Naphthalene

N-Butyl Alcohol
Nickel
Nickel Compounds
Nitric Acid
Polycyclic Aromatic Compounds
Trichloroethylene
Xylene (Mixed Isomers)
Zinc Compounds 1,494,796
National Security 4 Copper
Copper Compounds
Ethylbenzene
Ethylene Glycol
Lead Lead Compounds
Manganese
N-Butyl Alcohol
Nickel
Xylene (Mixed Isomers) 428,639
Fossil Fuel Electric Power Generation
Industrial Gas Manufacturing
Petroleum Bulk Stations and Terminals
Petroleum Lubricating Oil and Grease Manufacturing
Petroleum Refineries 13 1,2,4-Trimethylbenzene
1,3-Butadiene
Ammonia
Benzene
Benzo(G,H,I)Perylene
Carbon Disulfide
Carbonyl Sulfide
Chlorine
Copper Compounds
Cresol (Mixed Isomers)
Cumene
Cyanide Compounds
Cyclohexane
Diethanolamine
Dioxin And Dioxin-Like Compounds
Ethylbenzene
Ethylene
Hydrochloric Acid
Hydrogen Cyanide
Lead Lead Compounds
Manganese Compounds
Mercury Compounds

Methanol
Molybdenum Trioxide
Naphthalene
N-Hexane
Nickel Compounds
Nitrate Compounds
Phenanthrene
Phenol
Polycyclic Aromatic Compounds
Propylene
Styrene
Sulfuric Acid
Tetrachloroethylene
Toluene
Xylene (Mixed Isomers)
Zinc Compounds 1,771,352
Flat Glass Manufacturing
Glass Container Manufacturing
Lime Manufacturing
Other Pressed and Blown Glass and Glassware Manufacturing 4 Barium Compounds
Lead
Lead Compounds
Zinc Compounds 2,133
Fabric Coating Mills
All Other Plastics Product Manufacturing
All Other Plastics Product Manufacturing /Sheet Metal Work Manufacturing
All Other Plastics Product Manufacturing /Industrial Mold Manufacturing /Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
Fiberglass products manufacturing
Plastic materials manufacturing
Plastics Pipe and Pipe Fitting Manufacturing
Urethane and Other Foam Product (except Polystyrene) Manufacturing 13 Chromium
Chromium Compounds
Di(2-Ethylhexyl) Phthalate
Dichloromethane
Diisocyanates
Manganese
Methyl Methacrylate
N-Methyl-2-Pyrrolidone
Phenol
Styrene

Toluene Diisocyanate (Mixed Isomers) 637,300
All Other Converted Paper Product Manufacturing
All Other Miscellaneous Wood Product Manufacturing
Coated and Laminated Paper Manufacturing
Paper (except Newsprint) Mills
Paperboard Mills
Pulp Mills /Paper (except Newsprint) Mills /Coated and Laminated Paper Manufacturing
Pulp Mills/Paper (except Newsprint) Mills
Sawmills
Softwood Veneer and Plywood Manufacturing 13 Acetaldehyde
Ammonia
Barium Compounds
Benzo(G,H,I)Perylene
Catechol
Chlorine
Chlorine Dioxide
Diisocyanates
Dioxin And Dioxin-Like Compounds
Ethylbenzene
Formaldehyde
Formic Acid
Hydrochloric Acid
Lead Lead Compounds
Manganese Compounds
Mercury Compounds
Methanol
Naphthalene
Nitrate Compounds
Phenol
Polycyclic Aromatic Compounds
Propionaldehyde
Sulfuric Acid
Toluene
Xylene (Mixed Isomers)
Zinc Compounds 2,279,122
Paint and Coating Manufacturing 5 Certain Glycol Ethers
Di(2-Ethylhexyl) Phthalate
Ethylbenzene
Ethylene Glycol
Manganese Compounds
Methanol
Methyl Isobutyl Ketone Methyl Methacrylate

N-Butyl Alcohol
Styrene
Tetrachloroethylene
Toluene
Xylene (Mixed Isomers) 24,092
Wood Preservation 2 Dioxin And Dioxin-Like Compounds
Pentachlorophenol Polycyclic Aromatic Compounds 22

From: Derek Poon

Date: 05/07/2008

Comment: Forgot to note that this proposed listing is for land locked Kokanee, and causes are all fresh water, not hatchery, harvest, hydro, or the ocean.

This will change the landscape a bit for Puget Sound Lowlands. One more listing with an equally difficult chance for recovery. I attached a report on field conditions.

The challenge is that sedimentation (not contaminated sediment or TSS) and flow are usually not listed under CWA 303d; as you can tell from my report, that makes it very difficult to treat the problem. A sediment TMDL can be done, such as for Upper White and Simpson HCP, but Ecology has not shown an active interest at this time.

Attached pdf file:
Federal Register 6 May 2008_lk samm finding.pdf

From: Lincoln Loehr

Date: 05/07/2008

Comment: The attached comments are submitted on behalf of the City of Everett. Please pass them along to the people who are working on revisions to the water quality paper.

Comments re discussion draft paper on Water Quality in Puget Sound.
The following comments were prepared by Lincoln Loehr and are submitted on behalf of the City of Everett.

Citations/References.
The document provides cites to references for many statements, yet there is no list of references. The paper should switch from the citation approach and

use the method in the Initial Discussion Draft Paper on Human Health that included footnotes that provided the details of the reference, as well as a web link to the reference where possible.
Page 1 (should be page 3), second sentence in paragraph 5 asserts that "over 1,000 freshwater bodies around Puget Sound are listed as Category 5 impaired water bodies on the 303(d) list…."
It is incorrect that there are over 1,000 freshwater bodies around Puget Sound that are listed as Category 5.
The listings are for individual parameters and for individual segments of waterbodies. For example, in one waterbody, Woodland Creek in WRIA 15, there are 9 separate listings (1 segment for pH, 1 segment for bacteria, 3 segments for temperature, and 4 segments for dissolved oxygen) yet it is just one waterbody. Therefore, the actual number of water bodies listed is substantially less.
Instead of saying that over 1,000 freshwater bodies are impaired, you should say that there are over 1,000 listings specific to individual parameters and specific segments of freshwater bodies.
Page 1 (should be page 3), last sentence in Paragraph 5 asserts that PAHs appear to be increasing.
Are they? Based on what? National Mussel Watch data showed increases several years ago, and decreases more recently in Puget Sound. (Dr. Alan Mearns, NOAA, personal communication)
Page 4, paragraph on nutrients only describes nutrients in terms of being a threat.
Yes, excessive loadings can be harmful, but excessive is very much dependent on the amount of loadings, where the loadings occur, and site specific characteristics. Nutrients can also be inconsequential or even beneficial. For that matter, organic matter can also be beneficial in some cases and harmful in others if in excess.
Page 4, paragraph that says, "The fjord-like structure and underwater sills of Puget Sound restrict the circulation of marine water in several locations, and reduce the flushing exchange with the ocean water entering from the Pacific. This hydrologic isolation puts Puget Sound at greater risk form all three categories of pollutants than other estuaries in North America." The quote is attributed to the Puget Sound Action Team, 2007).
The paragraph is incorrect. There is nothing about the hydrologic condition of Puget Sound that puts it at greater risk from nutrients, pathogens, or toxics than other estuaries in North America. The sills influence the flushing exchanges, but in some cases, such as Admiralty Inlet, they serve to oxygenate the mix of water that then flows into the deep water of Puget Sound, such that in the main basin, dissolved oxygen concentrations at 600 feet are considerably higher than in the Pacific or in the Strait of Juan de Fuca at the same depth. Pathogen issues generally are localized, associated

with local sources, be they septic systems, stormwater runoff, pets, farm animals or natural wildlife, and there is nothing about Puget Sound's hydrology that puts it at greater risk from pathogens than other estuaries in North America. Similarly, there is nothing about Puget Sound's hydrology that should put it at greater risk from toxics than other estuaries in North America, especially those with comparable or greater populations around them. With nutrients, the issue is nutrient addition to surface waters that would otherwise be naturally depleted of nutrients, and many other estuaries in the country have the same concern.

Page 4, second to last sentence in paragraph on water quality in Puget Sound freshwater systems states that "there have been an increasing number of impaired water body listings….. over the last 10 years."

An implication of such a statement is that things are getting worse. However, it may simply represent more observations have been made.

Page 4, paragraph on Impaired lakes, rivers and streams. The last two sentences describe documented impairments based on the 2002 305(b) report and the 2004 303(d) list.

These sentences should be deleted. The 2002 305(b) report is incomprehensible as to how they calculated anything. There is no basis for the assertion that 50% (plus or minus 25%) of the Puget lowlands freshwater stream miles exceeded metals standards. The footnote itself refutes the claim, as does the discussion of metals on page 12 ("only 8 sites out of 639 where dissolved metals and mercury results were reported exceeded 2006 Washington State water quality standards chronic criteria [this is statewide], and none were in the Puget Sound basins."

The last sentence makes the mistake of implying 151 waterbodies in WRIA 9 were impaired, which is a problem of confusing the number of waterbodies with the number of listings specific to particular parameters and particular segments of waterbodies. The number of waterbodies impaired will be substantially less than 151.

Page 5, second paragraph from the bottom says that "most impairments of existing water quality standards for marine waters in the main Puget Sound basin are for fecal coliform bacteria and low dissolved oxygen. It also describes 704 listings for pathogens in 2004.

There is a problem in terminology. What is meant by the "main Puget Sound basin"? The usual description of the main basin of Puget Sound is from Admiralty Inlet to the Tacoma Narrows. As used here, it must be including Hood Canal and Southern Puget Sound and more. It is confusing.

The 704 listings attributed to pathogens are actually for bacteria. The bacteria measured are not pathogens. They are an indicator that pathogens could also be present, but they are not measures of pathogens. Some observations could be entirely due to birds, seals, or other wildlife and may be entirely free of pathogens.

Page 5, last paragraph describes over 30,000 acres of commercial shellfish beds closed due to water pollution, including fecal contamination. It then attributes it entirely to human related sources, septic systems, stormwater, and agriculture.
Change to read, "…..closed to harvesting due primarily to fecal coliform bacteria contamination." and then also acknowledge that birds and other wildlife can also be sources of fecal coliform bacteria.
Page 6, paragraph on Metals. Pertaining to marine waters, it says that widespread impairment from metals is uncertain.
This should be changed to read, "There is no widespread impairment from metals." Existing observations support that there is no metals impairment of marine waters with the possible exception of mercury for which there are some fish consumption advisories. There are localized areas with impairment of sediments from metals from historical sources of contamination.
Page 6, paragraph on endocrine disrupting chemicals. The paragraph asserts that a survey of marine waters in King County obtained results similar to those for freshwater lakes, rivers, and streams.
Does that just mean similar in what was detected, or does it also mean similar in the concentrations of what was detected? If the concentrations in marine waters are lower, then the results are not similar.
Page 9, paragraph on wastewater and septic systems. This paragraph notes that combined sewer overflow outfalls sometimes discharge mixed stormwater and untreated wastewater to Puget Sound …
The implication of course is that combined sewer overflows are bad. However, cities that have combined storm and sewer systems are also treating much of their rainwater at sewage treatment plants, which is good, and which is not accomplished with cities that have separate storm sewer systems. So ….. there is both an upside and a downside, and probably a net upside.
Page 10, paragraph on Pathogens, last two sentences.
Second to last sentence add "and birds" after "including marine mammals".
Last sentence: change the term "pathogens" to "indicator organisms. This better matches the first sentence, and is a truer statement as well.
Page 10, paragraph on Wastewater discharges. The statement incorrectly paraphrases from page 3 of the Hart Crowser et al., 2007 report. The study did not find a total load and work backwards as is implied.
Page 10, paragraph on Combined sewer overflows.
It is correct to note that CSO's contribute relatively little to the total loadings. Combined storm sewer systems should actually be credited with providing treatment to more stormwater and therefore reducing loadings compared to separated systems.
Page 11, paragraph on Effects on lakes.

It is worth mentioning that Lake Washington is now less productive than it was in the 1950's and 1960's which demonstrates that nutrients had a beneficial side, as well as a detrimental side.
Page 12, paragraph on Sediment cleanup.
This one sentence paragraph should be expanded some. It should note the cleanups that have occurred.
Page 13, paragraph on Creosote-Treated Timber Piles.
The paragraph should note that DNR and Ports and other groups have been actively removing substantial numbers of creosote-treated pilings in the last decade. The paragraph should also note that rail ties are creosote-treated and are located on rail right-of-ways close to marine and freshwaters.
Page 13, last paragraph.
The last paragraph has a sentence that says marine water temperatures are expected to increase in Puget Sound due to increases in air temperature and changes to freshwater inflows. I think that marine water temperatures will not be likely to increase due to changes in freshwater inflows, so the sentence should be changed to only attribute possible increases to increases in air temperature.
Page 15, paragraph on stormwater.
Second sentence refers to an attached map reflecting an analysis of pre-1995 development in King County. The map actually presents an analysis of pre-1990 development.
Page 15, paragraph on Source control measures.
Second sentence refers to "surface water pollution prevention plans" and should say "storm water pollution prevention plans" instead.
The third bullet is awkward and needs to be revised.
The following additional bullets could be added.
• Switch from leaded to unleaded gasoline,
• Industrial source control programs administered by municipal dischargers and by Ecology.
• Case-by-case implementation of water quality-based effluent limits in the NPDES permits, when technology based limits were not enough.
• Addition of hardness, or other measures to municipal water supplies to reduce corrosion and release of metals from metal plumbing.
• Cleanups of impacted sediments, and source control measures at upland sites associated with those sediment sites.
Page 18, section on Wastewater.
The first paragraph says that secondary treatment…is effective in reducing loads of …. fecal coliform bacteria. Actually, the bacteria are controlled by disinfection, and not secondary treatment.
The same paragraph says that most larger facilities are operated to remove some nutrient. This would be true only to the extent that secondary treatment removes some nutrients, but secondary treatment is not designed for nutrient

removal, so the sentence may be misleading.
The first sentence in the second paragraph says that well sited, well designed and constructed on-site wastewater systems are effective in removing pathogens… Probably better to say effective in removing indicator bacteria.
The end of the section notes that a discussion of findings on mixing zones and their effectiveness or limitations could be added here. The following is a suggested input.
Our state's water quality criteria are recommended concentrations of analytes in a waterbody that are intended to protect human health and aquatic organisms and their uses from unacceptable effects from exposures to these pollutants. The state's criteria are mostly based on EPA's water quality criteria. The criteria are not directly comparable to concentrations in a discharge because the criteria not only have a concentration component, but also duration and frequency of exposure components. Mixing zones provide a useful link between water quality criteria and discharge permits. Both EPA and the state recognize that water quality-based effluent limits are derived from and comply with water quality criteria and may incorporate dilution based on the state's mixing zone regulations. The size limitations of mixing zones in Washington state assure that durations of exposure for organisms are substantially less than the duration of exposure component of the acute, chronic, or human health water quality criteria. The use of mixing zones allows implementation of water quality criteria in discharge permitting in a manner that is consistent with the exposure assumptions that the criteria are based on.
For more information on mixing zones see the EPA Memo from Benjamin H. Grumbles, Assistant Administrator to Regional Administrators dated July 13, 2006 regarding Mixing Zones; EPA's Compilation of EPA Mixing Zone Documents, EPA 823-R-06-003, July 2006; the state's mixing zone regulations WAC 173-201A-400, and related implementation guidance in the Permit Writer's Manual.
Page 18, The discussion about management approaches addressing water quality for wastewater should provide more details as to how the program works. The following wording may work.
NPDES permitting of municipal and industrial wastewater discharge includes both the use of individual permits and general permits covering a range of facilities. Permits are good for five years, and application for permit renewal must be made a half year before the permit expires. Permits are administratively extended if issuance of the new permit is delayed. The permit process imposes technology based requirements, and then evaluates whether water quality-based effluent limits, more stringent than technology based requirements, are needed. The process uses a statistical analysis of effluent data to identify a maximum expected effluent concentration, and then allows dilution of that concentration with ambient water, equal to the

allowed dilution at the edge of the acute or chronic mixing zone. Following that dilution calculation, the resulting concentration is compared with applicable water quality criteria and if found to exceed, then a water quality-based effluent limit is imposed. Imposition of water quality-based effluent limits drive additional actions, be they source control or treatment, in order to meet the limit. Permits also evaluate the need for limits of the toxicity of an effluent, and may require other studies, such as sediment studies, dilution studies, and verification that the underwater outfalls are intact and functioning properly. For stormwater permits, the general permits focus on stormwater pollution prevention plans and implementation of best management practices. Some include monitoring requirements. Some individual stormwater permits include specific effluent limits, while the general industrial stormwater permit includes monitoring and comparison of results to benchmarks, which if exceeded require facilities to take additional actions to improve the stormwater quality. Ecology's Permit Writer's Manual provides more details regarding the NPDES permitting program.
Page 19, second paragraph. Change the first two sentences to read:
In general, municipal and industrial wastewater treatment plant operators routinely monitor effluent quality to document compliance with NPDES permit conditions. Monthly Discharge Monitoring Reports are submitted to the Washington State Department of Ecology.
Page 20, first paragraph.
The last sentence needs to also note that the CWA establishes requirements for measuring and limiting the toxicity of effluents, and that the State has established and implemented a means for doing so.
Page 20, second bullet under Stormwater heading,
should say "….municipal separate storm sewer system (MS4) permits."
Pages 20-21, third bullet under Stormwater heading, add to the end of the sentence
"as well as stormwater permitting in individual industrial permits."
Page 21, third bullet under Wastewater heading, change last sentence to read,
These permits outline requirements for discharge limits and require effluent monitoring to document compliance with the limits.
Page 22, first paragraph under Stormwater heading. Change last sentence and add a sentence as follows,
To date, Phase 1 and Phase II municipal stormwater NPDES permits have not required monitoring. Stormwater monitoring is required in the industrial general stormwater permit, and a number of industries with individual permits include monitoring of stormwater.
Page 23, last bullet under Stormwater heading. This bullet says that there is no area-wide application of CWA NPDES for stormwater in watersheds or areas with known water quality problems.

The industrial general stormwater permit does have additional requirements when a stormwater discharge is to a 303(d) category 5 listed receiving water.
Page 23, first paragraph under Wastewater heading,
There are significant errors and shortcomings in this paragraph, specifically, it fails to acknowledge that toxics water quality of the effluent is evaluated and water quality-based effluent limits are imposed when needed, and whole effluent toxicity is similarly evaluated. For some, sediment quality is also evaluated. Larger municipal facilities also implement an industrial pretreatment source control program and household hazardous waste turn in facilities. The state implements the industrial pretreatment programs for smaller facilities. Municipal facilities conduct regular effluent quality monitoring, but generally do not conduct receiving water monitoring.
Page 23, first sub-bullet under bullet under Wastewater heading,
The sub bullet talks about the generous funding of 75% federal in the early days of implementation of the CWA. The reality is that much of the country received that level of funding, but the discharges to marine waters were a lower concern and most did not get the 75% federal funding, thereby paying much greater percentages out of pocket.
Page 24, second bullet under Wastewater. This bullet focuses on reuse of treated wastewater as an alternative to marine and freshwater discharge. This section is problematic because it is pushing for reuse even to the extent of minimizing its cost as a water source by throwing the costs of treatment on the discharger, regardless of consideration for whether there is an environmental need to treat to such a level in order to protect surface waters. Reuse makes sense on a case-by-case basis, where a local water quality concern necessitates reducing discharge, or a benefit is derived from the local ability to reuse the water. Reuse, as a means of increasing effective water supply does not make sense on a broad scale because conservation measures can do the same for less cost.
Page 25, first bullet at the top.
This section says that while secondary treatment has been the standard for years, higher levels of treatment and reduced discharges are now being driven the DNR. I am not aware of any cases of DNR driving a higher level of treatment. I am aware of DNR driving dischargers to relocate outfalls so as to not preclude the harvest of geoduck clams. The section seems to praise the designation of outfalls as a non-water-dependent use because it will open the door to additional options for wastewater discharge, such as land application of biosolids or reuse of wastewater. Those options are always there and can be considered where appropriate. Land application of biosolids is common now, and reuse of wastewater occurs in some appropriate areas. Designation of outfalls as a non-water-dependent use does not open the door to additional options. Rather, it closes a door to an existing option that has worked well in the past, and forces much higher costs on society. The higher

costs prevent being able to afford other more beneficial actions.
Page 25, discussion about Combined Sewer Overflows and Combined Sewer Systems
As noted before in these comments, combined sewer systems offer some advantages along with the risks of CSO events. More stormwater in communities served by combined sewer systems, receives treatment before discharge than in communities served by separate stormwater systems.
Page 25, section on On-Site Sewage Systems.
The first bullet notes that standards for septic system design do not typically address removal of nutrients and toxic compounds. There actually are septic systems that can perform very well on nutrient removal. The standards for new systems going into the upper Methow Valley in Okanogan County require the new septic systems, and where there are concerns with nutrients in either the groundwater or the surface water, the newer septic systems should be used.
Page 26, section on Airborne Pollution
The name of the Puget Sound Air Pollution Control Authority was changed a number of years ago to the Puget Sound Clean Air Agency.
I doubt that air deposition of arsenic or cadmium is significant now. There is a good study of the sources and fates of certain phthalates that presents new dilemmas, as they outgas from vinyl and other plastic products over the life of the product, then in the atmosphere bind to fine particles, then drop back to the land either by dry or wet deposition, and then runoff in stormwater, accumulating in sediments in quiescent areas that receive the stormwater. Other chemicals may follow a similar pathway.
Page 27, section on Source Control
This section needs to discuss the various source control programs implemented by municipalities and by Ecology. The industrial pre-treatment program is one. Household hazardous waste turn in programs is another. Hardening of the city of Seattle's water supply is another (it reduced corrosion of metal pipes in the city, thereby reducing metals going to the treatment plant). Programs are getting started for turn in of unused pharmaceutical products.
These all should be recognized, and encouraged.
There is no mention in the document about trash. Plastic debris in particular is a significant water quality concern. The Seattle area is home to a preeminent marine trash oceanographer, Curtis Ebbesmeyer. Perhaps he can offer some wording for the document.
Page 28, first paragraph.
The paragraph asserts that Since 1995 when the first Phase 1 NPDES municipal stormwater permits came online, only a handful of urban streams or lakes have been removed from a 303(d) listing and more have been added. Is this true? How many such listings have been removed?

Page 29, first bullet at top.
This bullet says "Wherever possible, turn stormwater and wastewater into water resources."
The idea sounds good, but needs to be moderated, so that it does not result in requiring a blind application of technology to do so everywhere. That has potential to be very costly, and somehow such an approach needs to be moderated to apply where it is needed as a water resource, or needed for a real environmental need.
Page 29, first bullet under Stormwater
This emphasizes need to begin or accelerate retrofits of impervious surfaces in untreated urban areas. Note that this may be very costly. Seattle recently retrofitted 660 feet of a residential roadway at a cost of $850,000. The retrofit resulted in approximately 99% of the total runoff potential being retained. (See page 68 in the April 2008 issue of Water Environment & Technology) What does this cost for the whole city?
Page 29, an additional bullet that could be added.
Develop a strategy to rapidly replace brake pads state wide when copper free brake pads become available. This is probably the single most effective thing that can be done to reduce copper loading from urban runoff, which may be a problem in urban streams. The turnover needs to happen faster than just waiting for replacements to occur.
Page 30, first bullet under Wastewater.
The focus in the first bullet is on requiring tertiary or Class A wastewater treatment and reuse to reduce nutrient loadings to nutrient-sensitive areas. Another option that should also be included is to discharge in deep water so the effluent traps below the pycnocline, thereby not introducing the nutrients into the nutrient sensitive surface waters. It works, so don't preclude it.
The section also identifies that increased expenses in energy and operating costs must be considered in the balance. To that, the paper should also add greenhouse gas emissions need to be considered.
Page 31, first bullet
This section calls for reviewing wastewater outfalls for potential decommissioning. This is simply another call for tertiary treatment or treatment to reuse standards. The paragraph should be removed. Deepwater discharges of nutrients are much different than shallow water discharges. Source control strategies may be better approach than end-of-pipe treatment strategies.
Page 33, second paragraph in bullet to Evaluate existing water quality standards.
The paragraph implies that the only toxic substances criteria for the state are those in Table 240(3) in Chapter 173-201A WAC. Human health water quality criteria for toxic substances, applicable in Washington state are found in the National Toxics Rule 40 CFR 136.31 and are specifically called

out in WAC 173-201A-240(5). Chapter 173-205 WAC is also the whole effluent toxicity testing and limits rule that imposes WET testing and a means for imposing limits where needed.
The paragraph recommends that DOE adopt numeric limits for common pollutants (e.g., phthalates) for which there are no current state criteria. The paragraph confuses "limits" with "criteria" and the two are not and should not be the same thing. The paragraph should comment that DOE adopt criteria, not limits.

From: Heather Trim

Date: 05/07/2008

Comment: Attached is a comment letter on the science portion of the WQ Paper. We have separately submitted comments on the policy component as part of the Environmental Caucus.

Attached Word file:
People For Puget Sound Water Quality Issue Comment LetterMay 6 2008.doc

From: Mark Hersh

Date: 05/07/2008

Comment: Please consider these comments for both the Water Quality discussion as well as the Land Use/Habitat Restoration and Protection discussion. Also, please forward on to the Ecological Monitoring and Adaptive Management work group. Attached are three documents from Ecology, one marked "draft," dated April 3, 2008, and the other a letter from Jay Manning to the Forest Practices Board, dated April 4, 2008, and a joint Ecology/USEPA document dated January 11, 2006.

The Ecology documents state that the monitoring/adaptive management program set up by the Forests and Fish Report in 1999 will fail to provide Ecology with the needed information whether to extend the "Clean Water Act assurances" provided by both Ecology and EPA in 1999. The assurances were designed to delay the development of TMDLs for watersheds all or predominantly in forests (see "cwa 0106 white paper" document).

This relates to the Partnership's effort in two ways. First, we do not know whether the current forest practice rules will attain water quality standards, including numeric water quality criteria (temperature and sediment) as well as biological integrity (protected by the antidegradation policy of the water

quality standards). Studies have not been initiated, or if they have, completed to tell the story whether the forest practice rules protect biological integrity of headwater streams (for the most part, those considered "Type Ns" and "Type Np" in the forest practice designations). Some of these habitats and the species they support will not be found elsewhere in the watershed (the earlier Caucus comments on Land Use/Habitat pointed out that Washington's standards were recently revised to explicitly include protection for all aquatic species, fish and non-fish).

Therefore, both final issue papers need to point out that water quality and habitat may still be adversely affected by ongoing forest practices (besides the legacy of past practices with which we must deal).

Second, this relates to the highly-touted monitoring and adaptive management program that came out of the Forests and Fish negotiations. From what I hear, may be used as a model for a Puget Sound monitoring/AM program. The evident problems of this program in developing the data needed for some of the most basic questions on water quality and habitat show that there are some serious flaws that must be investigated and considered before adopting this same approach for Puget Sound restoration, an effort that will require monitoring many more habitats, species, and parameters than the Forests and Fish effort has had to deal with.

Thanks for considering these points.

Attached PDF files:
Review of CWA Assurances (Ecology draft 4-3-08).pdf
Forest Practices Board 4-4-08.pdf
cwa_0106whitepaper.pdf

From: Allison Butcher

Date: 05/07/2008

Comment: Attached please find our association's initial comments on several of the topic forum discussion papers. Please let me know if you have any questions.

Attached PDF file:
Topic Forum Papers_May_08.pdf

From: Naki Stevens

Date: 05/07/2008

PugetSoundPartnership
our sound, our community, our chance

Comment: For Water Quality, Habitat, and Biodiversity papers: Copper in stormwater runoff might play a role in coho kill-off in Longfellow Creek.

attached pdf file:
mccarthy.pdf

From: Ericka Fehr

Date: 05/07/2008

Comment: This is a proposal for the clean up of the Puget Sound. It is about an exciting Japanese technology, a microbial bio-remediation tool that is effective, ecologically sound, and inexpensive.

American scientists are getting more and more aware of the crucial role of microbial activity in living systems.

It makes sense that problems in biological systems are best managed with biological means.

It is about EM Technology(TM).

EM stands for Effective Microorganisms.

This technology has been used and proven since the 1980's in many countries for clean up projects.

In the 90's, a huge bay in Japan, "Seto Inland Sea", suffering from a condition similar to what is present in Puget Sound, was restored within only five years and harvesting oysters, clams and seaweeds was possible again.

EM1 allows a holistic approach to pollution utilizing processes of nature itself.

Wherever applied, in water, soil, or sludge, the EM1 microbes start to create a balanced micro ecosystem - rather than targeting isolated issues thus potentially causing secondary problems.

If regenerative life supporting microbes are dominating the medium, degenerative, putrefactive, or "stinky" ones are controlled and all processes are going into a beneficial direction. Dr. Teruo Higa, the discoverer of EM1, calls this a "Dominance Principle" to explain the mechanism of

microbial ecosystems.

He is a Japanese horticultural professor from Okinawa. Originally he developed EM1 as an alternative to conventional agriculture, but later to everyone's surprise it spread to other fields of application.

His formula includes three main strains that are working synergistically: Lactic Acid Bacteria, Phototrophic Bacteria, and fermenting yeasts.

EM1 productions in different countries are using locally adapted cultures of these common cultures.

One of Higa's most surprising discoveries is the fact that about 60% of microorganisms are opportunists, meaning they only follow the main stream. Therefore it is possible to balance any given media simply by supplementing regenerative microbes and establishing a strong beneficial population.

Higa's findings include also the happy marriage of aerobic and anaerobic microbes, once thought to be incompatible. The EM1 solution is able to work in anaerobic conditions for instance like sludge so that excavation is not needed.

EM1's outstanding effects on aquatic systems is related to restoring the cyclic food chain based on bacteria and subsequently algae, planktons, protozoa ... up to small and big fish.

The attached documents are showing EM1's ability to speed up the natural decomposition process of toxins and to deal with pathogens and even metals.
EM1 can be extended by feeding the microorganisms with molasses prior to application which makes it more economical.

This is only a brief introduction and attached are research documents for your perusal. I apologize for the poor reading quality of some of the documents.

Feel free to investigate more at the following links:

www.emamerica.com

Report about Seto Inland Sea clean up: www.emamerica.com > videos > "read more" > watch first video

I will send to you per mail Dr. Higa's book "Our Future Reborn", and an ECO Pure magazine with international EM Technology(TM) projects. Although the magazine reports are not scientific documents it is valuable to see what is possible with EM1.

Shortcut to:
http://www.emamerica.com/index.php?option=com_content&task=view&id=141&Itemi
d=218

(Attached: SAfricaViabilityPathogensEM.pdf, AquaticToxicity_Test.pdf, RawSewage efx.pdf, SadatCitySewageWater.pdf, Oil Spill Kanno.pdf, IFEMS Journal.pdf)

From: Ron McBride

Date: 05/07/2008

Comment: Here are two comment tables for the WQ and Human health Forum Topic papers. I hope you can help get these to the right person to get them posted. There is one other comment table on Habitat and Land Use that is sill being edited. Thanks, Ron

See documents:
PS_WQ_Topic Paper_Comments
PS_HumanHealth_Topic Paper_Comments

From: Darlene Schanfald

Date: 05/06/2008

Comment: This is Part 2 of the submission from the Olympic Environmental Council regarding our comments for the Topic Forum issues.

Air Operating Permits (AOP). (continued)
AOPs are overseen by two agencies. Ecology has selective oversight of some industrial sites; the Clean Air Agencies (CAA) over others. We strongly recommend that all AOP's be put under the CAAs in order to have consistent laws, oversight and enforcement.

Currently, Ecology's AOP regulations and oversight are so lax that industry

has little regulation, which is why there is so much air pollution.

Example (and see attachment)
http://seattletimes.nwsource.com/html/local news/2004189039_mill19m.html

The Director of Ecology needs to direct staff to respond to concerns of citizens, EPA and ORCAA.

Ecology must do the following to satisfy the citizens, to protect their health, and to protect Puget Sound.

A more responsive and transparent Department of Ecology:
1) An investigation should be conducted at the Department of Ecology to uncover reasons deficient permits are granted to industries that emit pollutants, and to weed out the root causes of an agency culture that has grown inappropriately cozy with the industry it is meant to regulate, while demonstrating hostility to the public it is chartered to protect.
2) Laws require there be adequate reliable monitoring data to prove compliance. Citizen reports of apparent permit violations to Ecology must be recorded, investigated, and tracked, and details of any investigation must be passed on to citizens and/or be made available upon.
3) Appropriate fines should be levied. Companies that need air(AOP) and water (NPDES)permits to pollute should put up significant funding for potential cleanup purposes. These monies can be banked by Ecology for future need. Legislation that lets polluting companies decide the type of guarantee it will give the agency should be done away with and proactive legislation should be written that protects the public good.
4) As the only agency with the legal right to request additional emissions information from corporations, Ecology must honor data requests from other agencies and not refuse legitimate requests from the Washington State Department of Health and the Clean Air Agencies.

OVERSIGHT AND ENFORCEMENT
1) An enforced responsive and transparent policy for citizen complaints about mill emissions.
2) Ecology must conduct more mill inspections.
3) Ecology must require reporting of emissions from the ponds on industrial sites.
4) Ecology must review mill complaint records monthly to ensure that maintenance problems do not continue for protracted periods of time.
5) Ecology must cite and fine industry when it a company is violating the Facility Wide General Requirements (FWGR) #'s 1, 2, and 7.

6) Ecology should conduct a study of soils for contamination as a result of contaminated dust/particulates from the mill emissions

AIR OPERATING PERMIT
1) Permits must "allow for meaningful review."
2) Permits must require 24-hour access to a real person via phone who can take citizen reports and begin an immediate investigation of problems as they arise.
3) Permits must require companies to report to Ecology citizen reports that include investigative information about mill conditions.
4) Companies must be required to promptly report all citizen reports
5) Permits must require monitoring of ambient air in the surrounding neighborhoods.
6) Permit must require complete testing and monitoring of pond conditions.
7) Companies must be required to document working order of equipment to Ecology monthly.
8) Permits must include a full accounting of fuels used and the contaminants contained in those fuels.
9) Permits must require more complete testing of reprocessed fuel oil (RFO) and a full air pollution modeling study on the effects of burning hazardous waste in the air.
10) Permits must request testing of the RFO ash composition.
11) Permits must require documentation of mill procedures to prevent the ash in company landfills from becoming fugitive dust.
12) Determination of waivers for meeting daily emission limits for criteria pollutants should be based on recent data, not data a decade old and reported to Ecology annually
13) Permits needs to require companies to meet the additional requirements for an acid rain generator.
14) Permit exemption limits need to be minimized.
15) There should be direct measurement of the most hazardous chemicals emitted by companies.
16) All TRS gases need to be reportable on a twice-daily average to track whether the polluter is increasing emissions at night.
17) Ecology must be given records for ALL fuels of ALL types used by companies.

COMPANIES THAT POLLUTE THE AIR
1) Companies should share monitoring and air condition information with the public and public agencies.
2) Companies should respond to citizen reports and comments with respect.
3) Companies should resolve their emission problems, especially on keeping air pollution equipment in good operating condition.

4) Companies should upgrade their equipment; grand fathering equipment should cease.
5) Companies should install pollution control equipment throughout their sites, and assure that the reprocessed fuel oil (RFO) does not have chlorinated compounds and solvents in the fuel.
6) Companies should capture all their pollutants and recycle materials that can be reused.

Adequate monitoring must be included in permits:
Per WAC 173-401-615, All air pollution laws must have adequate reliable monitoring that allow compliance to be judged.

Some State Laws that Ecology has refused to enforce:
Code:WAC 173-401-615
Monitoring and related recordkeeping and reporting requirements.
(1) Monitoring. Each permit shall contain the following requirements with respect to monitoring:
(b)

Impacts to health and property are banned by state law:
(WAC 173-400-040(5):
"The permittee shall not cause or allow emission of any contaminant if it is detrimental to the health, safety, welfare of any person, or causes damage to property or business."

WAC 173-400-040(4)
Air Act: Any person causing odor which may unreasonably interfere with use and enjoyment of property must use recognized good practices and procedures to reduce odors to a reasonable minimum

WAC 173-405-040 (10)
"The permittee shall at all times, including periods of abnormal operation and upset conditions, to the extent practicable, maintain and operate any affected facility, including associated air pollution control equipment, in a manner consistent with good air pollution control practice.".

WAC 173-400-105(2):
"Ecology shall conduct a continuous surveillance program to monitor the quality of the ambient atmosphere as to concentrations and movements of air contaminants. As a part of this program, the director of ecology or an authorized representative may require any source under the jurisdiction of ecology to conduct stack and/or ambient air monitoring and to report the results to ecology."

WAC 173-405-072(5)
Š.."Other data: Each kraft mill shall furnish, upon request of ecology, such other pertinent data required to evaluate the mill's emissions or emission control program".

PESTICIDES
The attached photos show the results of a snail whose habitat was invaded by Garlon 3A, compliments of the WA State Department of Transportation. Don't let the snail die in vain. Use it as the poster life for what pesticides are causing.

This was incident at Jimmy Come Lately Creek area in Blyn WA. Jimmy Come Lately Creek was just restored for salmon habitat with millions of dollars of federal, state, regional and local governments, including employee time and resources. Yet, the WA State Department of Transportation has no compunction about spraying the area to hold back vegetation along the highway, even though the highly toxic substance will float, one way or another, right into the Creek. Some of the areas sprayed extended down toward the creek and estuary and into the woods on the east
side of the estuary. The spray was as close as 10 feet away from the water.

Talk about cumulative affects! Noxious weed programs, county roadside vegetation management, the WA State Department of Transportation, the WA State Department of Agriculture, and the WA State Department of Natural Resources all apply cides, and right into wetlands.

Here's a local example of how cavalier and insensitive to harm government can be. In 1990, Clallam County banned county roadside spraying on ALL rights of ways to maintain vegetation, and have moved to mowing. Yet, a few years ago they turned to spraying the recreation trail, used for health, that runs from eastern Clallam County west to the City of Port Angeles and beyond, and with little to none notification that the trail area is sprayed with poisons that take 6 months to 2 years to have no impact, except that the area is sprayed more than once, so there is always a health and environment impact. This is were pregnant women, women of child bearing age, youngsters, babies are strolled, and pets are walked, as well as where wildlife tries to survive. Trail maintenance volunteers are too lazy to pull weeds along the trail and wanted to use toxins. Well, toxins only make plants resistant to the toxins, so the situation is bizarre and the county personnel does not want to educate the volunteers on the hazards of cides, or become educated themselves. Who suffers, all those using the trail and

the wildlife.

DNR aerial sprays. And on and on. Besides killing and maiming wildlife and eventually humans that are in the way, the poisons end up in surface and ground water; and in soil that blows all around.

OEC does not need to send you reading material. You should already know the issue and have easy access to getting more.

In sum, WA State needs to wean itself off of toxins and work with organizations like the WA Toxics Coalition, the Eugene OR based NW Coalition for Alternatives to Pesticides (NCAP), and the WA D.C. based Beyond Pesticides to plan a strategy to do this. Money will be needed from the WA State Legislature to bring such groups together to plan an agenda which will include the development of safe methods for handling noxious weeds, roadside and forest vegetation, etc., and, most of all, a plan to educate state employees, the medical industry personnel, nurseries, and the public on why they should not use poisons and what they can effectively substitute.

Many people are sickened and die from these poisons, acutely or over time. Many can not even afford to get well because they can't afford medical care. Public health must count, and so must the environment. These must be the two highest priorities to make healthy and keep healthy.

AQUACULTURE
Volumes of material have been written on this subject. Shamefully the WA State Department of Fish and Wildlife participates in this very toxic industry. NPDES permits are given to this industry by Ecology to pollute. And now DNR is involved.
The farmed fish industry is helping to poison Puget Sound, damaging bottom lands and ruining marine habitat and all aquatic life around these sites. Atlantic Salmon escapees have managed to take over wild spawning streams and move out the wild salmon from their historic sites. Sealice abound in penned fish. Diseases can spread between wild and penned fish. Interbreeding between the escaped penned fish and wild salmon have occurred, further ruining the wild gene pool. The penned fin fish food has enough toxins involved that pregnant women are warned not to eat the fish. Retail sellers don't label these as farmed fish. And NOAA is pushing to fill our waters, in state and beyond state boundaries, with penned fish farms.

http://www.doh.wa.gov/ehp/oehas/fish/farmedsalmon.htm lists some of the environmental concerns, yet exhibits no back bone to protect the public.

The West Coast Governors' Agreement on Ocean Health Draft Action Plan does not hold back on the problems this industry causes.

(http://query.nytimes.com/gst/fullpage.html?res=9A01E3D81031F93BA15756C0A9659C8B63&sec=&spon=&pagewanted=all)
Issues of Purity and Pollution Leave Farmed Salmon Looking Less Rosy
By MARIAN BURROS
Published: May 28, 2003

http://www.fluoridealert.org/pesticides/epage.teflubenzuron.htm
Teflubenzuron is an acyl urea derivate classified as an insecticide for use in treatment of infestation with sea lice in salmon. Teflubenzuron is admixed with pelleted diet at a level of 2 g/kg. The intended dosage level of teflubenzuron is 10 mg/kg bw administered once daily for 7 consecutive days. The substance is also used as a pesticide on crops. Very few substances are available for treatment of sea lice in salmon....t is likely that the sediments will act as a sink for teflubenzuron and so sediment associated organisms are more likely to be affected by this chemical...

A recent video of penned salmon impacts
http://www.youtube.com/watch?v=of3URNlMLMk
Alex Morton presents to Cermaq AGM

Additionally, DNR is leases public lands to geoduck farmers and are, themselves, doing massive sized research in the waters. But the white plastic bags and tubing don't remain stationary, move around, and cause some havoc in the marine system. Too, they reportedly snag birds. This plantings change beach ecology and wipe out other marine life, such as mussel beds. In sum, these plantings and farming are degrading state tide lands.

http://www.ProtectOurShoreline.org/legal/080326_PierceCnty_TaylorShellfishDecision.pdf
A recent Pierce County court decision and documentation of environmental impacts.

http://www.protectourshoreline.com/slideshow/POS_ShellfishAquacultureConcerns.pdf
A slide show of a geoduck farm on Nisqually Reach.

FLUORIDE

On August 13, The Lillie Center, Inc., filed ethics charges against the CDC's Oral Health Division and the CDC's director Julie Gerberding for failure to follow the CDC's own ethical code. The charge is specifically aimed at their failure to warn the public, especially the most vulnerable in the population--"kidney patients, diabetics, infants, and seniors", of the dangers of drinking fluoridated water. These dangers were clearly stated in the National Research Council's report (2006) on fluoride's toxicity, as well as concerns raised by the US Department of Agriculture about the total dose of fluoride people are getting from all sources, including food, toothpaste, mouthwash, dental floss, and dietary supplements, to name a few.

Not only is fluoride added to water which, we now know from a Harvard study is harmful to the development of youngsters 10 years of age and under and other studies regarding infants getting too much, but fluoride is in food and toothpaste, so it compounds the problem. Fluoride then runs down our drains into ground, then surface waters, and into the world of marine life. What is the effect on them?

The Environmental Working Group has added to its web site a long list of articles, etc. about fluoride impacts on humans.
http://www.ewg.org/featured/222

Further, from this web site (see (www.ada.org/prof/resources /positions/statements/fluoride_infants.asp):
"It is deeply troubling that children, including bottle-fed infants, will begin drinking fluoridated water without the benefit of the ADA warning and in spite of the many [other] serious concerns [about fluoridation] raised by the National Academy of Sciences last spring," EWG wrote. "Public water supplies should be safe for all consumers, young and old alike." (The letter is available at www.ewg.org.)
Last November, the ADA - long a strong advocate of fluoridation, said: "Infants less than one year old may be getting more than the optimal amount of fluoride" if they consume formula or food prepared with fluoridated water. ADA added: "If using a product that needs to be reconstituted, parents and care
givers should consider using water that has no or low levels of fluoride."

http://www.msnbc.msn.com/id/23651072/page/2/
This is an article about people looking for graves at the old Charles Manson sites. They use a detector that finds fluoride because it is expected to be in human bones and not animal bones.
(noted on page 2)

This is a review on fluoride toxicity to aquatic organisms:
Fluoride toxicity to aquatic organisms: a review
Julio A. Camargo,
Departamento Interuniversitario de Ecología, Edificio de Ciencias, Universidad de Alcalá, Alcalá de Henares, Madrid E-28871, Spain

Received 8 March 2002; revised 22 July 2002; accepted 23 August 2002. ; Available online 9 November 2002.

Abstract
Published data on the toxicity of fluoride (F?) to algae, aquatic plants, invertebrates and fishes are reviewed. Aquatic organisms living in soft waters may be more adversely affected by fluoride pollution than those living in hard or seawaters because the bioavailability of fluoride ions is reduced with increasing water hardness. Fluoride can either inhibit or enhance the population growth of algae, depending upon fluoride concentration, exposure time and algal species. Aquatic plants seem to be effective in removing fluoride from contaminated water under laboratory and field conditions. In aquatic animals, fluoride tends to be accumulated in the exoskeleton of invertebrates and in the bone tissue of fishes. The toxic action of fluoride resides in the fact that fluoride ions act as enzymatic poisons, inhibiting enzyme activity and, ultimately, interrupting metabolic processes such as glycolysis and synthesis of proteins. Fluoride toxicity to aquatic invertebrates and fishes increases with increasing fluoride concentration, exposure time and water temperature, and decreases with increasing intraspecific body size and water content of calcium and chloride. Freshwater invertebrates and fishes, especially net-spinning caddisfly larvae and upstream-migrating adult salmons, appear to be more sensitive to fluoride toxicity than estuarine and marine animals. Because, in soft waters with low ionic content, a fluoride concentration as low as 0.5 mg F?/l can adversely affect invertebrates and fishes, safe levels below this fluoride concentration are recommended in order to protect freshwater animals from fluoride pollution.
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V74-476073H-

From: Anthony Paulson

Date: 05/06/2008

Comment: Comments on Initial Discussion Draft- Water Quality Topic Forum.
S1. Detection limits inferred in paragraphs 2 and 3 are dependent on the

methods used. The paper seems to referring to routine analyses performed by waste water and storm management agencies. USGS believes that there is a role for research monitoring to investigate specific questions related to sources of contaminants and their biological effects using state-of-the-art analytical techniques.

Specifically,
par. 2, l.4: "since they cannot easily be detected"
par. 3, "In addition, some of the organic compounds of concern are of very low solubility in water and would not be easily be detected by routine measurements"

B. Sources and pathways for nutrients, pathogens, and toxics entering Puget Sound water bodies.
Point #1
The mass balance of any toxic constituent in Puget Sound is dependent both the dissolved and particulate sources and sinks in Puget Sound. For dissolved constituents, the aqueous concentration in source water and the volume flow of the source water determines the dissolved loading. For particulate constituents, the particulate loading is based on the discharge of particles to Puget Sound and toxic concentration on those particles. Therefore, the fundamentals of a mass balance of a toxic depend on precise knowledge of the sources and sinks of both water and particles. Because of the conservation of water and salt, the volume rate of flow of the freshwater and marine waters can easily be balanced by numerical modeling. In contrast, the sinks of particles (sedimentation and advection to the ocean) are independently measured from the measurements that quantify the sources of particles from rivers, shoreline erosion, etc. THE CONFIDENCE OF A TOXIC MASS BALANCE IS THEREFORE DEFINED BY OUR KNOWLEDGE OF SOURCES AND TRANSPORT OF SUSPENDED SOLIDS. There has not been enough emphasis on understanding the loadings of sediments in Puget Sound relative to the sedimentation in Puget Sound. We must know where particles in the sediments of Puget Sound came from if we are going to understand the relative impact of toxics on particles discharging from various watersheds.

The importance of particulate constituents in understanding ecological effects of contaminants is highlighted by inconsistencies within the document. On page 4, the document states that 50% ± 24% are impaired by metal pollution, but on page on page 12 it states that only 8 sites out of 639 sites exceeded aquatic water quality chronic criteria for metals and mercury. One conclusion from this inconsistency is that it is the amounts of suspended matter, some which contain natural levels of metals, that is causing

watersheds to be classified as impaired, rather than the levels of metals on the particles or on concentrations in the dissolved phase. More emphasis needs to be placed on controlling suspended solids in freshwater environments.

Point #2
The document does not emphasize the role that cycling of organic matter has on affecting the exposure and mode of action of contaminants on aquatic organisms. For instance, increasing loadings of organic carbon to the sediments caused by nitrate pollution will increase microbial cycling of organic matter, which drives the methylation of mercury, which accumulates in fish. I think if you were to ask Robin Matthews of Western Washington University, she would indicate that the best way to reduce mercury in fish in Lake Whatcom is to reduce phosphorus loading to reduce the microbial activity that leads to methylation of the mercury deposited from global sources.

From: Rich Sheibley

Date: 05/06/2008

Comment: Water Quality Topic Forum

There was a lot of discussion about low impact development (LID) as the best and most economical technology at improving water quality in the region. In addition, there was much criticism about how briefly this was mentioned in the topic paper. The paper cited LID as an alternative technology with very little research on its benefits to water quality. In response, one participant arrived with a CD of 60+ references on just porous pavement alone. While there is a lot of research on LID in general, there is a need for more local studies documenting LID benefits under regional weather and climatic conditions.

Source control should be a prominent management goal if there is any real hope to cleaning the sound. Our breakout group kept coming back to this issue. In general, there was a feel we need to ban harmful products and suggest and/or require alternative less harmful products when applicable. For example, PBDEs were recently banned, and the same can be done for other emerging pollutants. In highway runoff, zinc can be a major pollutant, which primarily comes from brake pad wear. Therefore, substituting zinc in brake pads should reduce zinc in runoff. In some cases, there are simple alternatives available, other times there are not. In addition, there are some cases where alternative are known, but implementation can be difficult. The

paper mentioned the REACH program in Europe, and this is a good starting point.

It was felt that the topic paper was sometimes narrow in its focus. Some felt that the focus was more on storm water, and did not address wastewater and groundwater enough. Others felt it was urban-centric and there needed to me more discussion of rural and agricultural areas and forest practices and how they influence water quality.

There was also discussion of how the language was directed towards 'improving water quality' rather than improving AND protecting water quality. Several people noted that in some areas, water quality is currently excellent, and those areas should not be ignored but protected from future actions. Along those lines, was a discussion that new development is required to address water quality issues, whereas existing infrastructure is not. So retrofitting should take a bigger role for the future. In addition, there was consensus that 'grandfathering' with respect to the regulations should be stopped altogether. This was a loop hole that should be fixed as soon as possible.

Finally, there was a lot of discussion about institutional barriers to making progress. These barriers include funding to: monitor water quality in general, and implementing and enforcing regulations; and getting the right people talking to each other. Currently different groups regulate different resources (e.g., groundwater versus surface water) and there need to be communication between these groups.

In addition to the general themes from the water quality meeting, there are several data gaps that should be addressed in this paper.

Work on developing new standards and criteria are warranted. The standards are revised periodically to comply with the clean water act, and changes should be incorporated for the next round of revision. First, we are currently facing several emerging pollutants where criteria do not exist. For example, PBDEs, endocrine disruptors, etc. These pollutants are starting to take center stage, and we need criteria to compare to for monitoring projects. In addition to new criteria, modification of existing criteria are needed. In particular, dissolved metals are showing sub lethal effects to salmon at levels currently less then the current water quality criteria. Nutrients are a common problem around the Sound, and currently there only exists nutrient criteria for lakes. It is difficult to establish nutrient criteria because each receiving water body will act differently, but there should be some guidelines for rivers, streams, storm water and wastewater. Next, progress needs to be made on developing

set freshwater sediment criteria. Currently freshwater sediments are ranked on guidelines, and criteria from outside the region. In order to access the transport and fate of sediment bound pollutants, freshwater standards need to be established. Finally, some research is being conducted at WSU showing that there are synergistic effects of pollutants. When combined, pollutant mixtures can be more toxic. For the future, more research should be undertaken to examine the extent of this phenomenon for better overall protection of aquatic life and human health. Modifying the current criteria is important because they are the best measure of how water quality is changing over time.

Fecal coliform is often used as an indicator bacteria for water quality. However, sources of the bacteria are rarely identified. Several microbial source tracking (MST) studies have been completed in the area (e.g., Pipers Creek, Green/Duwamish), and although they can be costly, the results can be very informative. For locations where bacterial violations are a common occurrence, a MST study should be initiated in order to determine management options. King County and SPU have worked with Herrera Environmental Consultants on several studies of this type.

As the topic paper is written, it is a little marine centric. Puget Sound is the end point of pollution; all pollution will find its way into the sound. However, that is a large water body, and although there are problem areas (Duwamish, Elliot Bay, Hood Canal, etc.) the open water is relatively good quality. King County has a marine water monitoring program that does a good job. Their data show that, except those sites near outfalls, metals, nutrients, toxics are low. It is recommended that monitoring marine water quality continue under this program and future efforts focus more on the sources, rather than the endpoint. In other words, it is important that the partnership learns about pollutant loading from streams, rivers, wastewater, storm water, nearshore septic systems, and land use changes. This information can be related to data collected by King County's marine program.

It is common in the literature to see that results related to storm water are specific to that region due to differences in weather, climate, population, and land use practices. The water quality forum paper was criticized for saying that there is not much research on LID and its benefits to water quality. However, in the Puget Sound area, there are only a few studies on LID and on storm water impacts, and there is a need for a better understanding of local factors influencing LID and storm water runoff in general. This should be a high priority for the future. In the 1980's, there were several studies of highway runoff conducted by the University of Washington and the Federal

Highway Administration looking at factors controlling pollutant in highway runoff. Since that time, there have been no additional detailed studies in Puget Sound. Much has changed in the region since the 1980's and there is a need to understand what factors are currently controlling pollutants in storm water runoff in the area in order to develop appropriate clean up strategies. Local data for different land use types is needed in order to design and implement treatment technologies, as well and manage sources of important pollutants. Some work has been completed locally and should be compiled. For example, the city of Seattle recently completed a street sweeping pilot study and their results should now be available.

From: Tim Gugerty

Date: 05/06/2008

Comment: AWC Comments on Puget Sound Partnership Water Quality Topic Forum Discussion Paper

AWC's membership and Board of Directors has adopted a Land Use and Environmental Stewardship Policy Resolution that provides helpful context for our comments below on specific preliminary policy recommendations. Highlights of this Resolution include the following overall statement and principles:

A core function of cities and towns is their ability to plan for, manage and protect land uses and municipal services within their borders. These fundamental activities are frequently the subject of considerable discussion and debate within each community and are undertaken within an increasingly complex array of state and federal laws governing land use and environmental protection.
Washington's cities and towns desire to both maintain and expand opportunities for their citizens to live, work and play in vibrant and healthy communities.
To support cities and town in fostering land use and environmental stewardship, AWC shall work to:
• Maintain cities' fundamental and basic planning and zoning authorities.
• Oppose measures that would encroach upon city authority to protect the public interest, health, safety, and welfare.
• Maintain local discretion as to the intensity and character of growth accommodated within each community.
• Adopt clarifications at the state level to help guide how cities and towns are expected to protect environmental values while providing opportunities for growth and development.

• Encourage the state to work in partnership with cities, towns and other local governments to develop its own strategic plan to help foster healthy and vibrant communities.
• Ensure that federal and state regulatory authorities recognize regional and local difference in how best to apply and mitigate impacts from their programs or activities.
In addition, the following principle from AWC's Flexible General Government Operations Policy Resolution provides helpful context:
• Encourage legislative and administrative solutions that are free of unfunded mandates, and strongly oppose additional state and federal mandates (both legislative and administrative) unless they are accompanied by sufficient financial resources and are compelled by significant public interests.
AWC Comments on Specific Recommendations

Policy Question 2 (P2): Strategies to Improve Water Quality in Puget Sound

A. Principles for improvement

Recognize that water quality improvement opportunities need to be closely orchestrated with land use/habitat and water quantity strategies and with the decisions of individual land owners.
o The pertinent question is this should be outlined or promoted in the ACTION AGENDA? What statutory changes would be required? For instance, how to reconcile strategies with GMA growth projections and inherent "filling in of urban growth areas"?
• Focus on ecosystem function improvement
o There seems to be a recognition that to do so, it will take multiple strategies and interests. The example of LOW IMPACT DEVELOPMENT will take time, education and of course, only impacts NEW development. Improving conditions within the BUILT COMMUNITIES will be much more challenging.
• Strategies for moving forward will need to embrace uncertainty; adaptive management will continue to be an essential element of moving toward water quality health.
o The Action Agenda needs to recognize learning and adaptation as the actions unfold. FOR INSTANCE, the new NPDES PHASE II permit was issued only a little over 1 year ago (2/07). Permitees have a 5-year implementation schedule – not all actions are required immediately. The Action Agenda needs to recognize the incremental nature of this permit and help and be prepared to evaluate what changes should be made to it after the 5-year implementation schedule.
• Control source of known pollutants without introducing new and ultimately

more problematic constituents (reduce, reuse, recycle).
o Cities can be helpful partners. What specific types of actions might cities take? How can cities help educate citizens?
• Certainty: Accelerate the implementation of known solutions that have already proven to be effective.
o Need more specifics and examples.
• Increase feasibility for new and emerging strategies by resolving regulatory and technical barriers.
o This will be challenging and requires a commitment of resources – both technical, political and financial. Because the Partnership doesn't have regulatory authority, the power of persuasion based upon logic and good information will be critical.
• Whenever possible, turn stormwater and wastewater into water resources.
o This can be technically and financially challenging. There's also a significant public education element needed to facilitate acceptance and support.

B. Preliminary recommended near-term strategies

Stormwater

• Begin or accelerate retrofits of impervious surfaced in untreated urban areas.
o AWC has SERIOUS CONCERNS with this recommendation. While an understandable and worthy goal, how would such an effort be accomplished? Cities don't and likely wouldn't want to regulate pre-existing and legal uses to address deficiencies in stormwater management. Funding doesn't exist to do this and if new funding was authorized, has there been any cost/benefit analysis on where and how to do this?
o Phase I and Phase II NPDES cities are currently focusing their attention on how to implement these critical permits. Adding new responsibilities in the short-term is a concern.
• Reuse stormwater generated from rooftops for non-potable uses. Rooftops constitute a significant portion of impervious surfaces in developed areas.
o Agree that regulatory barriers should be removed to facilitate reuse of rooftop stormwater.
o Concurrently, public education and technical assistance from the state and others (water utilities?) needs to be provided to facilitate voluntary uses.
• Coordinate with regional transportation efforts.
o Agree that working towards reductions in vehicle miles traveled and providing alternative transportation choices will be helpful. Coordination is needed at the state, regional and local levels.
• Mapping of interjurisdictional stormwater networks

o Unclear how ready cities are to participate and how much of a "solution" this is – needs more clarification please.

Wastewater

• Require tertiary or Class A wastewater treatment and reuse of WWTPs to reduce nutrient loadings
o This references "nutrient-sensitive areas of the Puget Sound" – is there a map or general description of which ones these are and a corresponding list of wastewater treatment plants adjacent to them- also whether or not such plants process reused water – why or why not?
o Need much more information to provide an informed opinion.

• Expand outreach efforts to reduce emerging pollutants in personal care products such as EDC's and pharaceuticals.
o Agree!
• Identify and replace failing septic systems, with particular focus in areas with demonstrated water quality problems such as shellfish closures and hypoxia.
o Good idea – how? When? Funding? Incentives vs. regulatory?
• Review wastewater outfalls for potential decommissioning.
o Need more information please.

Land Use

• Focus protection efforts on intact and high-quality lands and watersheds
o Good idea – is there an identified listing of priority lands?
o How significant a role might protection of these lands be from a water quality perspective? What funding would be needed to secure them?
• Integrate land use and water resource planning
o AWC STRONGLY DISAGREES with the statement that "land use and stormwater, wastewater, septic systems, and other water uses are inextricable intertwined and yet not planned together." We suggest this is "opinion" and not supported by fact. GMA, water system planning and provision of municipal services within and adjacent to cities are integrated. That may not be the case in the unincorporated portions of counties – not sure.
o AWC STRONGLY QUESTIONS the statement "Land use is a determinant in water planning but not the reverse." GMA planning is conducted in ALL 12 counties and 112 cities adjacent to the Puget Sound. Water availability is a key to determining where growth can occur and whether or not a permit for development can be issued. Protection of environmentally sensitive areas is a GMA requirement. The Municipal Water Rights law of 2003 restates that municipal water rights can be grown

into within urban growth areas AND that conservation is now required, not just encouraged.
o AGREE that more thought can be given on how to best integrate planning for growth, water resources and protection of water quality in the Puget Sound. How best to do so requires a BROAD discussion with MULTIPLE STAKEHOLDERS and is not advanced by broad statements of opinion.

C. Regulatory strategies

Stormwater, wastewater, and land use

Increase the clarity of stormwater regulatory programs. A variety of adjustments in existing stormwater regulations could reduce the threat of pollutants contributed by sources that aren't fully captured by existing stormwater regulations:

• Expand municipal separated storm sewer system (MS4) permits geographically to include communities that fall under the population threshold for areas contributory to 303(d) listed water bodies.
o NPDES Phase I and II permits cover most of the cities in the 12 Puget Sound Counties. The vast amount of population in the region is covered by these permits.
o Which additional cities or unincorporated urban growth areas aren't currently covered and are potential contributors to a specific list of 303(d) listed water bodies?
• Address all surface water discharges in MS4 permits
o Which specific discharges aren't now covered?
o When would any new changes to the permit be made?
• Implement source control for existing developed commercial areas.
o How? When? By who? Who pays?
o AWC has serious concerns about this recommendation at this time.
• Develop a strategy for treating urban pollutants such as copper, zinc, phthalates, and PAH's.
o Need to know more and how city experts consulted.
• Develop and implement creative approaches for agricultural-related discharges . . .
o No comment at this time.
• Address the lag in adoption of new stormwater standards with state vesting laws (e.g. many properties may be grandfatered in" and not subject to current regulations).
o Currently, new stormwater standards at the local level apply to NEW development.
o Changes to the state's vesting laws have been attempted SEVERAL times

for non-stormwater related reasons. This is VERY controversial – legislative leaders should be consulted with.
• Improve the rate of compliance with existing permits, which may require additional staff trained in both the science of stormwater and the realities of construction.
o Elaborate more please . . . . which permits need better compliance? Phase II NPDES ones are just now being implemented and in stages. Is this construction or industrial permits?
o Enforcement is most always something that can be improved. It's not just more staff that might be needed, but also education and technical assistance to those being regulated.
• Conduct monitoring to determine if permits and programs are effectively implemented and effective in intent (water quality improvement)
o ABSOLUTELY! This should be of HIGHEST PRIORITY!
o Phase I and Phase II cities need to know whether or not their actions are having intended effect.
o They also need to know whether actions or inactions of others are impacting water quality.
o Cities are working with the Administration and others on developing and fine tuning the monitoring program. PLEASE consult with this group for details.

Establish watershed area-wide permits that focus on the multitude of discharges that occur in logical geographic areas, rather than discharge-specific inputs or jurisdictional boundaries.
o More information needed before cities weigh in. This is a HUGE and SIGNIFICANT change to the current permitting system.

Source control
Implement more comprehensive chemical management in Puget Sound.
o Need more information and consultation with city experts

D. Recommendations for further assessment

• Evaluate the role of sediment in water quality issues to better define the relative contribution of previously contaminated sediment to the overall health of Puget Sound, including the effectiveness of sediment cleanup programs, recontamination issues, and source control program effectiveness.
o Sounds helpful – need to further consult with cities.
• Evaluate the link between stormwater pollutant loads and ecological effects. While it is clear that changes in stormwater hydrology affect aquatic organisms through damage to habitat, the effects of stormwater pollutants on the organisms themselves is much less understood.

o This suggests a study to determine the effectiveness of stormwater BMP's.. Might be helpful – need to further consult with cities.
• Evaluate existing water quality standards. The question of the level of protection provided by our current water quality standards is at the core of any effort to determine the effects of pollutants on aquatic habitats. Existing water quality standards need to be reviewed for protectiveness.
o This also suggests consideration of higher standards for more sensitive water bodies. All might be useful – timing and scope of the study, along with costs are all important to consider. Need to further consult with cities.
• Improve understanding of the dynamics and levels of nutrients in Puget Sound
o Need to further consult with cities

From: Marina Hench

Date: 05/06/2008

Comment: Please see the attached response to the Water Quality report produced last month. Michael Campbell, our President, attended the forum on April 25. I hope that you will consider these concerns as you move forward with the Action Agenda.

The mission of the Northwest Marine Trade Association is to grow recreational boating. We do this by producing the Seattle and Everett Boat Shows, by advocating for our 800+ members in state and local governments, and working to improve the "quality of boating" in the Northwest.

Water quality matters to us for two main reasons: First, we want to boat in clean water. Boaters have an intimate relationship with Puget Sound and its creatures. Second, NMTA represents 86 boatyards who are regulated under the National Pollutant Discharge Elimination System (NPDES) permit. Stormwater is a huge challenge for the boatyards. The current permit could put many yards out of business, and certainly increase the cost of boating in our state.

This memo is a response to the April 14, 2008 Initial Discussion Draft paper for the Water Quality Topic Forum, part of the Puget Sound Partnership Effort. My comments are:

1. Page 8 discusses the Effects of Stormwater Pollutants on Species. We concur that there is not enough information on the impacts of stormwater on salmonids. In addition to lacking information about frequency, magnitude, and duration of olfactory impairment, we also do not know how salmonid

behavioral changes translate into real losses of juvenile salmon in wild populations. (However, Dr. Nathan Scholtz at NOAA told us that they are currently conducting related studies.) For all we know, the real problem could be dams rather than predation.

2. On page 13, the paper addresses creosote-treated timber piles. Under current regulations, there is no way for a person to install any new treated pilings in our state. All waterfront construction permits (such as installing pilings) are channeled through the Army Corps of Engineers and the Washington Department of Fish and Wildlife. A marine biologist at Fish & Wildlife told us that both they and the Army Corps never allow the installation of creosote-treated pilings. These agencies take their direction from Chapter 220-110 of the Washington State Administrative Code.

3. Page 14 discusses Management Approaches to Addressing Water Quality. (A.) lists the preventive measures for stormwater pollution, which include permitting and best management practices. The current system of regulatory-based pollution prevention is not only inadequate, it is restrictive and bad for business. We propose that the State consider implementing incentive-based strategies for stormwater management, such as tax credits and recognition programs. The State should also offer grants to small businesses for implementing stormwater treatment retrofits and installing new treatment technologies.

4. We want to reiterate the section on page 16 that states, "Current design and application of BMPs for stormwater are not demonstrated to consistently achieve water quality standards." This is because they are sometimes illogical. For example, boatyards are required to put plastic tarps under boats when they do their work, to catch paint and other solids. When the wind blows, all of those solids are displaced and fly into Puget Sound. The tarps are then put in dumpsters and sent to the landfills.

From: Darlene Schanfald

Date: 05/06/2008

Comment: I am submitting comments for the Jefferson and Clallam Counties Olympic Environmental Council.
While we have participated building the topic forum issues with the Environmental Caucus, the OEC wishes to address in more detail air operating permits, pesticides, the spreading of sludge, and aquaculture. These relate to human health and water quality.

I will send you more information tonight, but below is information on sludge and a bit on air operating permit oversight by Ecology (see attachment).

Overall, we would also like to see the WA State Legislature implement and enforce laws that disallow state or any municipal agency staff from going to work for industry upon leaving their jobs; that former state employees involved in regulations of industry would have to wait two (2) years prior to accepting employment with any business/business industry they helped regulate. It is wrong to ask the public to pay for the training, health and other benefits and retirement of personnel, that then go to work for business/industry the public paid to regulate. Such a legislative action would help dispel the realization, or perception, that government employees interpret laws favorable to whom they are regulating and that they fail to enforce.

Air Operating Permits (AOP).
AOPs are overseen by two agencies. Ecology has selective oversight of some industrial sites; the Clean Air Agencies (CAA) over others. We strongly recommend that all AOP's be put under the CAAs in order to have consistent laws, oversight and enforcement.

Currently, Ecology's AOP regulations and oversight are so lax that industry has little regulation, which is why there is so much air pollution.

Example (and see attachment)
http://seattletimes.nwsource.com
/html/localnews/2004189039_mill19m.html

SLUDGE and INDUSTRIAL WASTES USED AS FERTILIZERS
There are numerous articles and and data on these subjects. I don't intend to do the research work for the PSP staff, but here are some references:

The best reference for the history of how a hazardous waste, municipal waste, was approved for spreading across farm fields and now through nurseries and home gardens is: Toxic Sludge is Good for You, by John Stauber and Sheldon Rampton, Chapter 8. The Sludge Hits the Fan
Publisher: Common Courage Press, Monroe, ISBN 1-56751-060-4
The lead EPA scientist, William Sanjour , refused to go along with giving EPA approval to "recycle" it and call is "biosolids" and lost his position.

For the most complete insight into EPA politics on approving sludge as "biosolids" to be spread on land across the country, see
http://pwp.lincs.net/sanjour/ Collected Papers of William Sanjour

There are thousands of articles on this, legal actions where sludge spreading has affected the health of citizens, including causing death, legal actions, and air and water pollution. In sludge can be pesticides, heavy metal, POPs, pharmaceuticals, prions, personal care products,industrial wastes, etc... Most of these are not tested for at waste water treatment plants.

Message
For Immediate Release Adrienne Dominguez
May 16, 2005 916-445-4641

Senate Says No to Sludge!
Bipartisan Florez-Ashburn team produces Sludge Ban

Defeat for powerful sanitation districts
SACRAMENTO - Senate Bill 926 authored by Senator Florez which would allow Kern County to ban or further regulate the importation of sludge passed the Senate floor today with a vote of 26-9.

"Over two-thirds of the Senators voting today said 'no' to the sludge industry and 'yes' to protecting California's groundwater. It is a victory for the small communities all over the state," said Senator Florez.
Sludge, also known as biosolids, contains pollutants including hazardous materials and carcinogens which may have long-term health affects. The substance is applied to fields and used as a fertilizer.
Kern County receives one-third of the state's sludge mostly from Los Angeles, Orange and Ventura Counties. Other counties have banned or increased restrictions on the importation of sludge due to health concerns.
Senate Bill 926 passed the legislature today with bipartisan support.
"Our community must never be the dumping ground for the discards of others in California," Senator Ashburn said. "Leave the sewer solids in the areas where they are produced and treat them there. Don't dump on us!"

Senate Bill 926 will now move on to the Assembly.

* http://video.ap.org/v/default.aspx?m k=en-ap&g=a748c288-d140-4936-85a2-112fd42c1de2&f=ap&fg=email
NAACP asks attorney general to probe sludge research
Apr 14, 2008 3:55 PM (4 hrs ago) AP
Filed under: BALTIMORE , Sludge Poisoned Land

http://ap.google.com/article/ALeqM5g bpCMPX9_kRtYkL1Yv9-OzuVxFfQD901UF900

April 14, 2008
Senate Plans Hearing on Sludge
By JOHN HEILPRIN Associated Press

http://www.baltimoresun.com:80/ news/local/bal-md.sludge15apr15,0,3970131.story
Senate panel to eye sludge study
By Stephanie Desmon | Sun reporter
April 15, 2008
A Senate committee led by California Sen. Barbara Boxer plans to look into government funding of studies that put fertilizer made from treated human and industrial waste on the lawns of East Baltimore rowhouses and a vacant lot near a school in East St. Louis, Ill.
Additionally, the president of the Maryland NAACP said yesterday that he is asking federal and state officials to launch a criminal investigation.

InsightMag.com
07/24/2000
EPA's Secret Role in Toxic Sludge
By Sheila R. Cherry

"William Sanjour, then chief of
OSWMP's Technology Branch, said, "It would be impossible to write guidelines or regulations for one without taking into account EPA's policy for the other."
If municipal sewage sludge had been deemed as potentially dangerous as industrial waste, it would have been regulated as hazardous and subject to the Resource Conservation and Recovery Act, or RCRA.
But in 1978, after heated jurisdictional exchanges, officials in EPA's Office of Water coaxed their colleagues at OSWMP to exempt sewage from RCRA
regulations on the grounds that "it contains nutrients and organic matter which have considerable benefit for land and crops." There would be safeguards, OSWMP officials were assured. Once the transfer was completed,
however, the promise of parallel standards quickly was forgotten, says Sanjour."

http://www.zwire.com/site/news.cfm?newsid=19446417&BRD=1395&PAG=461&dept_id=216620&rfi=6
Toxic fumes, blisters and brain damage : The cost of doing business? After years living near the largest industrial farm in New York, residents' health symptoms take on national relevance as the EPA prepares to roll back air-

pollution reporting requirements for industrial animal farms. Ithaca Times, New York.

http://www.mabiosolids.org/docs/peot-protocols%20for%20timely%20response%20project.pdf
'Timely Response to Sludge Health Complaints Protocol'

There is also the issue of fertilizer mixed with industrial waste.
The Seattle Times investigative reporter, Duff Wilson, wrote a series of articles in the 1990s, entitled Fear in the Fields.
Many people that purchase fertilizer for their gardens do not know that they could be contaminated with industrial hazardous waste. For years this was a well kept secret until Patty Martin, former Quincy WA Mayor, and some farmers in her area discovered this. (See, Seattle Times Fear in the Fields series and the book, Fateful Harvest , all by Duff Wilson, former investigative Seattle Times reporter.
http://www.bioethicscourse.info/onlinetextsite/fearinfields.html))

Wilson's nonfiction book, Fateful Harvest: The True Story of a Small Town, a Global Industry, and a Toxic Secret (HarperCollins, Sept. 4, 2001), won book-of-the-year honors from the national group Investigative Reporters and Editors. Fateful Harvest

From: Sue Joerger

Date: 05/06/2008

Comment: The following are the comments of the Puget Soundkeeper Alliance (PSA) on the document titled “Initial Discussion Draft Water Quality Topic Forum” dated April 14, 2008.
The mission of the PSA is to protect and preserve the waters of the Puget Sound Basin. In order to do this, PSA patrols Puget Sound by boat to identify, document and report illegal pollution; enforces the Clean Water Act by using the citizen lawsuit provision to bring permit violators into compliance with NPDES permits; uses the administrative appeals process to improve NPDES permits; participates in numerous stakeholder committees; and develops solution-oriented partnerships and voluntary compliance programs like Clean Marina. PSA has been on the forefront of stormwater regulation and enforcement since its first appeal of the Industrial and Construction General Stormwater Permits in 2000.

PSA was created in 1984 and was a participant in the development of the first “State of the Sound 1986 Report” (Puget Sound Water Quality

Authority, July 1986). Since that time there have been numerous updates to the State of the Sound, including the most recent "State of the Sound 2007" and numerous Puget Sound recovery plans including the "2007-09 Puget Sound Conservation & Recovery Plan" (Puget Sound Action Team, July 2007). For long time participants in this process, there is a high level of frustration that the Action Agenda is not starting where the existing State of the Sound and Recovery Plan left off.

Use of contractors to write the Action Agenda

PSA is concerned that environmental consultants with industrial, construction and municipal clients have been hired to assess water quality problems in Puget Sound. Over the years a number of environmental consulting firms have refused to work for PSA because of concerns that it would affect their client base. It is apparent from some of the gaps in the water quality document that significant client-based issues were ignored including stormwater complying with water quality standards, low impact development research, the impact of mixing zones and the failure to address industrial stormwater and wastewater issues. It is critically important to the success of the Action Agenda that the process is credible and has no inherent biases.

Overall recommendations for final document

Although it is obvious that considerable time and effort was invested in the preparation of the draft document the final document can be significantly improved.

One of the difficulties in assessing the document was not knowing who was involved in the preparation and review of the document and whether it represented the views of the consultant hired to write the report, the Core Team members or some combination. To address this issue, PSA makes the following recommendations:

1) identify the contractor hired to prepare the paper
2) identify the authors and their affiliations
3) identify the Core Team members and their affiliations

There were also significant gaps in information about both sources of pollution and policies effecting water quality. The document focused heavily on municipal stormwater issues, yet did not address stormwater from boatyards, construction sites, the Washington State Department of Transportation (WSDOT), or unpermitted sites. On the other hand the

contribution of industrial wastewater sites to Puget Sound pollution was not mentioned. In terms of policies, the document also failed to address the use mixing zones and whether or not stormwater should comply with water quality standards. PSA will make specific recommendations section by section, but generally recommends that in order to produce a credible document that fairly and accurately assesses water quality issues facing Puget Sound the paper should be revised to:

4) address all sources of pollution
5) address all significant water quality issues

Finally, although there were some footnotes in the document these were not included in a bibliography and there were also some sweeping conclusions that were not documented that should be because of their controversial nature. PSA recommends that the final document:

6) document significant conclusions
7) include the references in a bibliography

Science Question 1 (S1): Status of Water Quality in Puget Sound

There are two broad conclusions under S1 that require more discussion. First, is the statement that regulatory agencies cannot trace pollutants to its sources.

Department of Ecology (Ecology) requires all NPDES permit holders to sample stormwater and wastewater. Some permit holders are also required to sample flow and receiving water quality. This data can also help trace pollutants to its sources.

8) Ecology's Water Quality Permit Life Cycle System (WPLCS) data base summarizes pollution permit data including water quality sampling data reported on discharge monitoring reports, which can be sorted by a number of fields including location of permit holder, type of permit, pollution parameters and nearest water body. The link is as follows: http://www.ecy.wa.gov/programs/wq/permits/wplcs/index.html

In addition, the Emergency Planning and Community Right-to-Know Act of 1986 requires Ecology to produce the following report which can also help trace pollutants to its source.

9) "The Chemicals in Washington State Summary Report 2004 – Toxics Release Inventory and Tier Two Emergency and Hazardous Chemical

Inventory" (Department of Ecology, Publication 06-04-020, September 2006) provides information on the discharge of pollutants by the top industrial dischargers of pollutants in Washington State.

The second broad conclusion is that the waters of the Puget Sound are not universally contaminated. Any discussion of polluted waters in Puget Sound should include an estimate of how many of the water bodies have actually been sampled for impairment by all relevant parameters. Ecology estimated that approximately 5% of the state's streams and 3% of lakes and marine waters were assessed for impairment in the 2004 Water Quality Assessment. Since the 303 (d) list relies on voluntary studies and voluntary submissions of data on impairment, it may be that additional sampling is needed to get a more comprehensive estimate of impairment in the Puget Sound Basin.

A. Documented threats to freshwater and marine water quality in Puget Sound

The first paragraph of this discussion only mentions threats from "increasing amounts of chemicals entering aquatic ecosystems." Stormwater sampling from industrial and boatyard sites have documented high levels of metals discharges (see WPLCS data base) into freshwater.

10) Contamination from metals like copper, zinc and lead should be mentioned
as well.

Water quality in Puget Sound Freshwater Systems

Impaired lakes, rivers and streams

11) The section on Impaired lakes, rivers and streams should reference the 2004 Integrated Water Quality Assessment (Department of Ecology) and the status and preliminary conclusions of the 2008 Water Quality Assessment (Department of Ecology) process to make sure data more recent than the 2000 and 2002 reports cited in this paragraph.

Groundwater

12) In the section on Groundwater a discussion of groundwater contamination related to industrial sites like the Duwamish River or Commencement Bay should be added.

New section – Pesticides

13) Pesticides should be addressed in freshwater systems as well. The USGS Fact Sheet titled "Pesticides detected in urban streams during rainstorms and relations to retail sales of pesticides in King County, Washington" (USGS 097-99, April 1999) documents 23 pesticides detected in water from urban streams and their potential sources including lawns and gardens and nonresidential areas.

B. Sources and pathways for nutrients, pathogens and toxics entering Puget Sound water bodies

Stormwater Runoff

There is sampling data available in WPLCS from boatyard and industrial stormwater monitoring that documents high copper discharges.

14) Under the Stormwater Runoff section copper should be added to the list of toxic chemicals entering marine waters due to stormwater runoff.

Range and Variability of Pollutants

There is sampling data available in WPLCS and Herrera documenting the metals found in stormwater including copper, lead and zinc.

15) Under the section titled Range and Variability of Pollutants Herrera's report on industrial stormwater monitoring data should be referenced ("Evaluation of Monitoring Data from General NPDES Permits for Industrial and Construction Stormwater, Herrera Environmental Consultants, October 2006) because it includes an assessment of industrial stormwater violating water quality standards for copper, lead and zinc.
Wastewater and Septic Systems

Sewage treatment plants are allowed to bypass sewage treatment in accordance with certain NPDES permit requirements. This practice occurs at some sewage treatment plants like West Point in Seattle on a regular basis. A review of Ecology's permit files for sewage treatment plants would reveal the number and quantity of bypasses, because the permit requires documentation of each bypass.

16) Under the section titled Wastewater and Septic Systems wastewater treatment system bypass during periods of heavy rain should also be mentioned as a source of untreated or partially treated sewage.

Industrial and Commercial Practices.

The first paragraph of this section concludes that industry has reduced pollution over the last few decades, but that mostly past practices are still affecting water quality.

17) This statement does not recognize the ongoing contribution of industrial pollutants to water quality degradation and is a significant oversight.

18) The first paragraph also overlooks Lake Union and the Lake Washington Ship Canal and Bellingham Bay as industrial areas of the Puget Sound Basin.

Air deposition

Aerial deposition of zinc has been individually documented by a number of industrial facilities that are required to sample stormwater for dissolved zinc. Reports of these few samples appear to indicate that close to 50% of the zinc in stormwater runoff may come from aerial deposition.

19) There is anecdotal evidence that zinc is being aerially deposited.

Recreational Water Activities

20) Gray water discharges (from sinks and onboard washing machines) are also sources of an undocumented amount of pollution.

Science Question 2 (S2): Management Approaches Addressing Water Quality

A. What are the main scientific findings relating to management approaches and their documented effectiveness in Puget Sound?

According to the "State of the Sound 2007" (Puget Sound Action Team) Report Card, of the 25 indicators used to assess the status of Puget Sound health, 17 indicators have a negative or declining trend including marine and fresh water quality; toxics in sediments; toxics in Chinook, coho salmon; declining populations of pinto abalone, marine birds and harbor seals; increases in impervious surfaces; forest land loss, and climate change factors including temperature, sea level rise, stream flow and snow pack.

Based on this information it is difficult to conclude that historic and current management practices have not been effective in maintaining the health of

Puget Sound.

21) “The State of Puget Sound 2007” should be integrated into the final document.

Stormwater.

The discussion of stormwater is inadequate.

22) Under source control measures, the document needs to be revised to include best management practices like covering products or processes exposed to stormwater; paving unpaved sites; cleaning out catch basins; installing storm drain inserts; monitoring bag house dust; segregating stormwater and sending some stormwater to the sanitary sewer for treatment.

23) Under the discussion of treatment measures the newly released “Boatyard
Stormwater Treatment Technology Study” (Taylor Associates, Inc. March 2008) information regarding treatment of copper, lead and zinc should be discussed.

24) Also under the discussion of treatment measures, stormwater pollution for industrial, boatyard, construction and WSDOT discharges should be added to balance the discussion of municipal stormwater.

25) A GeoSyntec report is cited, however there is a more recent analysis by Herrera 2006 (cited earlier) that evaluates industrial stormwater discharges based on meeting water quality standards.

25) There is a one paragraph discussion of low impact development, which concludes that limited research has been conducted on the effectiveness of low impact development techniques to improve water quality. This is a significant issue that has generated literally thousands of pages of documents for the Pollution Control Hearing Board Hearing on low impact development. Once the hearing is completed, PSA’s attorney’s can provide copies of documents used by its expert witnesses to testify that low impact development can improve water quality.

26) Ecology estimates that 90% of industrial stormwater dischargers are not in compliance with the Industrial General Stormwater Permit. Ecology has inspected most industrial sites as required by ESSB 6415, however, this has not resulted in compliance with the permit. PSA has initiated over 65 enforcement actions under the Industrial and Boatyard General Stormwater

Permits to improve compliance.

Wastewater

27) Are mixing zones protecting water quality, particularly for bioaccumulative toxins, in Puget Sound? The failure to address this issue is a significant oversight.

B. How is the effectiveness of management techniques measured and documented?

Over forty species dependent on Puget Sound are listed as threatened or endangered either on state or federal lists. To PSA this is one of the most important indicators of the effectiveness of the management techniques used to regulate water quality and habitat.

Policy questions 1 (P1): policy approaches to address water quality in Puget Sound

A. Existing regulatory or management programs.
28) PSA recommends that state laws, including RCW 90.48 the Washington State's Water Pollution Control Act, are added to this discussion. RCW 90.48.080 states that "it shall be unlawful for any person to throw, drain, run or otherwise discharge into any of the water of this state, or to cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged into such waters any organic or inorganic matter that shall cause or tend to cause pollution of such waters…".
Stormwater

29) PSA recommends that under the discussion of the 2005 Stormwater Management Manual for Western Washington, Ecology's disclaimer that compliance with this manual will not result in compliance with water quality standards be disclosed.

Wastewater

30) PSA recommends that industrial wastewater be discussed in this section. It is a major oversight that a discussion of the contribution of industrial wastewater to the decline of Puget Sound is not addressed.

B. Limitations of existing programs

Stormwater

31) One of the key issues in stormwater management is the fact that Ecology has not required stormwater discharges to comply with numeric effluent limits based on water quality standards. Can Puget Sound be recovered if the largest source of pollution is not required to comply with water quality standards?

32) Again the focus of this discussion needs to be broadened to include industrial, boatyard, construction and WSDOT stormwater issues.

33) The reference to third-party lawsuits is inflammatory, one-sided and should be deleted or presented in an objective manner.

Industrial and construction stormwater in managed under general permits. This piecemeal approach especially in large industrial areas is inefficient and ineffective based on PSA's on the ground experience with enforcing the industrial permit.

34) Rather than coverage under a general permit some industrial sites like scrap metal yards and other high metals dischargers should be covered under an individual NPDES permit.

35) Second, industrial stormwater district permits that combine permit holders in appropriate geographic areas might be more efficient and effective. Combining financial resources to manage and treat stormwater from large districts might be an effective approach.

Wastewater

36) PSA again recommends that a discussion of industrial wastewater be added to this section.

37) The issue of flow blending and sewage treatment bypass is controversial and should be discussed in a more objective manner.

Airborne pollution.

38) There is some anecdotal evidence that zinc may also be deposited aerially in the Puget Sound Basin.

Direct Marine Pollution.

39) Although there is an MOU outlining procedures for waste management

this MOU is less restrictive than land based sewage treatment systems and not enforceable. Cruise ship waste should be covered under an NPDES permit with resultant effluent limits and monitoring.

Land Use Planning

40) PSA recommends that a more thorough discussion of low impact development and basin planning be added to this discussion.

Policy Question 2 (P2): Strategies to improve water quality in Puget Sound

41) Again industrial, construction, boatyard and WSDOT pollution should be
added to this discussion, since industrial stormwater has been covered under stormwater permits since 1995.

The end of paragraph 1 includes a statement that offers an opinion that stormwater permits are not the reason that there are more 303 (d) listed waters now than in 1995 when stormwater was first regulated. PSA disagrees with this statement. If the original stormwater permits had included a compliance schedule for compliance with water quality standards and full permit coverage by all stormwater dischargers the state of Puget Sound may be different that it is today. The failure of the regulatory scheme is significant.

42) PSA recommends that this statement be modified to reflect that there are different opinions on this issue.

A. Principles for water quality improvement in Puget Sound

An important bullet needs to be added to this discussion. There needs to be a level playing field where all known sources of pollution are being regulated on a similar basis. Dissatisfaction with the current regulatory system includes businesses that are required to do more to manage and control stormwater than municipalities and the WSDOT yet the volume of the pollutants they contribute are significantly smaller.

43) PSA recommends that a bullet be added that says water quality improvements must be made by all pollution contributors.

B. Preliminary recommended near-term strategies.

Stormwater

44) Again industrial, boatyard, construction and WSDOT stormwater is ignored and should be added to this discussion.

45) Again the question of requiring stormwater to comply with water quality standards is ignored and should be added to this discussion.

46) What about monitoring? How do we know whether any of this is being effective? Will compliance with existing water quality standards insure the recovery of Puget Sound by 2020 or is more needed?

Wastewater

47) What about phasing out mixing zones?

48) What about prohibiting the discharge of bioaccumulative toxins?

C. Regulatory Strategies

49) The whole Puget Sound Basin should be regulated for stormwater and wastewater pollution now rather than waiting for new waterways to be listed under the 303 (d) list.

50) If water quality standards are sufficient to recover Puget Sound then require all pollution dischargers a timeline for coming into compliance.

51) Streamline stormwater regulatory process. Existing stormwater permits are difficult to understand and implement.

52) Provide incentives for the implementation of LID, development of new treatment technologies and source control or product bans.

52) Evaluate mixing zones.

53) Develop a water quality standard for biological integrity.

54) How much time do we have to decide these critical issues before it is too late to recover Puget Sound by 2020?

Thank you for this opportunity to respond.

From: Sam Anderson

PugetSoundPartnership
our sound, our community, our chance

Date: 05/06/2008

Comment: On behalf of the 4,500 member companies of the Master Builders Association of King and Snohomish Counties ("MBA"), following are some initial comments on the Water Quality and the Land Use/Habitat Protection and Restoration topic forum discussion papers. We appreciate the opportunity to comment on these preliminary proposals.

PSRC Vision 2040 plan

We strongly support the idea of directing new growth to urban areas and promoting responsible, compact development patterns to help preserve forest and pristine lands in rural areas. However, we are concerned about language in the Land Use Discussion Paper describing Vision 2040 as a plan that "reduces growth levels in rural areas and supports maintaining the current urban growth boundaries."

First, while we agree most growth should be directed to urban areas, we must also recognize that a certain, limited amount of growth will continue to occur in rural areas. As such, our goal should be to identify sensible growth levels in these areas and to engage in a meaningful dialogue about how this growth should occur. For example, given long-term population projections, large lots in rural areas may ultimately cause more harm than good.

The problem with 2.5- or 5-acre zoning is that once it is established, it is very difficult, if not impossible to change in the future as we grow. Allowing this type of large-lot zoning outside existing urban growth areas would be very shortsighted because it only serves to promote sprawl and place added development pressure on our most pristine forestlands.

Large lot development can also cause more harm than good as impacts are spread across a larger area, potentially thwarting conservation efforts vital to the environment and our region's quality of life.

Second, it was never the intent of the Growth Management Act to rigidly maintain

current urban growth boundaries. Our urban growth areas must remain flexible as we continue to grow and be allowed to expand where appropriate, or to be re-shaped to allow for more sensible boundaries.

There are a variety of measures we can take to better accommodate growth and reduce barriers to infill development throughout the region. For example, local jurisdictions should reexamine height restrictions to allow greater density in urban areas. Also, concurrency should not be a state mandate because all this policy serves to do is to promote use of the single-occupant vehicle, which creates sprawl. Instead, projects should be allowed to move forward based on what city or county decision makers determine they can tolerate, want to do or need to do in order to satisfy their GMA housing requirements. Additionally, the Action Agenda should call out, recognize and adhere to growth targets established by the Washington State Office of Financial Management.

Single, integrated set of regulations We have serious concerns about the recommendation to adopt a single set of regulations to protect the ecosystem of Puget Sound. The MBA believes that local control allows for local innovation when it comes to critical areas regulations, the Growth Management Act, NPDES stormwater permits and so on. We have always maintained that performance
based requirements, rather than prescriptive regulations, are significantly more effective at achieving any desired ecological goal.
For example, we believe local jurisdictions should have the ability to provide reater flexibility in determining the size of no-build buffers around critical areas, depending on the quality and function of the critical area. We have long advocated for smart buffers that enable environmental protection and also allow property owners to responsibly use their land. Larger, one-size-fits-all buffers, which would likely result were this recommendation implemented, have the potential to restrict land availability for muchneeded housing in our region without providing any additional environmental benefits. Tools like "buffer averaging," where for example, a property owner makes a buffer larger in one area and smaller in another to make room for a home improvement, should be allowed if it can be demonstrated that wetlands still receive the same protections (i.e. meet the no-net-loss standard). Another such tool would be allowing buffer reductions, if wetland functions can be improved. We are concerned that a single, integrated set of regulations would hinder this type of local innovation and not be based on protecting the subject land's ecological function. At the same time, we are concerned that a one-size-fits-all approach would hurt local governments' ability to adequately balance other important GMA goals, such as directing growth to urban areas, providing adequate housing for residents, promoting economic development and preserving our rural and forestlands. In our view, local government is already overburdened with GMA planning, and adding one more layer of government would only serve to exacerbate the situation.
A single set MBA comment letter
of regional regulations is just an outdated method of concentrating power in he hands of a few, defeating the trend toward local governance and adaptive management for performance based results.
Finally, we are concerned about language in the Land Use Discussion Paper stating,"Where impacts are allowed to occur, net improvement of ecosystem processes, structures and/or functions should be required as a project outcome." The GMA creates a duty to protect, not enhance or restore, critical areas. Going beyond this standard, particularly inside urban areas, forces us to make difficult choices. Moreover, it unfairly burdens a few to fix the sins of the many.
Instead of pursuing a prescriptive approach, we believe the Partnership should explore opportunities to incentivize development and redevelopment

that restores degraded habitat, for example, with such things as smaller buffers or expedited permits.

Low Impact Development

The Land Use Discussion Paper includes a recommendation to require the use of low impact development. We strongly disagree with taking a mandatory approach to low impact development and cannot support an Action Agenda that contains this recommendation. Our association supports measures to encourage greater use of low impact development (LID) techniques, where appropriate. The MBA already promotes LID through our Built Green® program and through our educational offerings. However, as I emphasized throughout the first Puget Sound Partnership process, we would strongly oppose any attempt to require LID. While there are benefits to be gained from LID, we must also recognize its limitations. Infiltrative LID techniques do not work well over till soils or where water may be delivered to steep slopes subject to landslides.

The Puget Sound region is heavily dominated by till soils, often in combination with slopes. As a result, many of the more effective LID measures to reduce stormwater runoff are not feasible in much of the Puget Sound basin.

Additionally, some LID features, such as infiltrating roof runoff, are in many cases simply too expensive for dense urban infrastructure construction. Also, some fire districts, for example, are not receptive to narrower roadways, a LID feature that would lessen impervious surface. Furthermore, forcing certain LID features, such as rain barrels or rain gardens, on homeowners unlikely to use or maintain them is not realistic. Finally, it is unclear whether LID benefits in urban areas could be of a scale capable of having meaningful impact on Puget Sound.

That said we recognize LID techniques can be effective in naturally treating pollutants in stormwater and should be encouraged where appropriate. We believe the best way to promote LID is to remove regulatory barriers to it, create incentives for commercial and residential builders to use it and to educate the public about LID features they could employ.

Vested Rights Doctrine

The discussion paper recommends providing for a later vesting date for compliance with critical areas and shoreline regulations. We strongly oppose this approach and cannot support an Action Agenda containing this recommendation. Land use applications vest to current regulations, only when they are substantially complete. Complete applications can and often do include delineation and plans for critical areas and geotechnical studies, assuring protection of ecosystem processes, structures and functions. Landowners spend significant resources planning for and obtaining land use

approvals under existing codes. A later vesting date that would allow appeals to the Growth Management Hearings Board or legislative bodies would have the effect of slowing the permitting process, effectively increasing uncertainty and cost for developers. In many jurisdictions, the permitting process is already unduly long, difficult and expensive. This requirement would only serve to drive up housing costs and hurt our state economy. Also, it is important to note that current vesting laws in Washington do not apply to valid health, safety and welfare regulations or the State Environmental Policy Act. There may be justification for expediting permits under certain circumstances, namely
compliance with LID techniques, but the process of delaying vesting for other projects is not justified.
If a later vesting date were adopted, under what process would the new date be
established? Is there significant scientific evidence showing that a later vesting date would significantly improve ecological protections?
Delaying the point at which projects could vest would completely undo previous efforts to provide more predictability and certainty for landowners while providing greater opportunities to those seeking to stop development. Furthermore, the Legislature already considered and rejected this concept. We believe it would be inappropriate for the Partnership to attempt to circuitously adopt it. We believe changing the vested rights doctrine, as recommended in the Land Use Discussion Paper, would be completely shortsighted and irresponsible. We urge the Partnership to reject this recommendation.
Off-site mitigation programs
The Land Use Discussion Paper recommends expanding the availability of off-site mitigation programs. The MBA supports efforts to create more and better options for mitigation, and to that end we are participating in the Washington State Department of Ecology's Mitigation That Works Stakeholder Forum. In order to be successful, we believe that any adopted program must offer applicants a timely and predictable process.

Governance Recommendation
We find it very curious, to say the least, that the Land Use Discussion Paper recommends concentrating power in a single agency to ensure Puget Sound ecosystem policy goals are being met. According to the discussion paper, the underlying concerns this measure is intended to address is the lack or coordination among governmental agencies that play a role in protecting and restoring Puget Sound. It is our understanding that this is the very
reason the Puget Sound Partnership was created! As such, it would appear this
recommendation discounts the ability of the Partnership to deliver on its

mission before it has even had a chance to produce an Action Agenda. Instead, the drafters of the Land Use Discussion Paper suggest that what is needed is an overarching regulatory agency. We strongly disagree.

As an original member of the Puget Sound Partnership, we supported the creation of the Partnership in order to coordinate the numerous activities of agencies charged with managing the Sound. Now, one agency is guiding the recovery of Puget Sound and helping to prioritize actions that would have the greatest positive impact, while considering their consequence on both population and economic growth. We believe the current Partnership should be given the opportunity to do its job before advancing a recommendation that neither my association members nor the broader business community can support.

Education and Outreach

The MBA maintains that public education and outreach is critical to our success in improving the health of Puget Sound. In our view, everyone has an important role to play when it comes to the Puget Sound's recovery and future health. In particular, members of the public should be educated about individual actions they can take to improve water quality and water quantity. This includes everything from car washing and lawn care practices to how we dispose of unused pharmaceuticals and maintain septic systems.

The Water Quality Discussion Paper recommends expanding outreach efforts to reduce emerging pollutants in personal care products, and we believe that is a good start. However, much more is needed to build local awareness and action, engage volunteers and to encourage behavior change. We believe the Partnership should place much more emphasis on public education and outreach as part of our efforts to improve water quality in Puget Sound.

Also, an area we believe has been sorely lacking in the land use arena is public outreach and education on the benefits of Growth Management Act required density and urban growth areas. Local builders fight battles over density and suffer through constant appeals from individuals seeking to stop growth. The public doesn't want more density in their neighborhood, but they don't see that rural and forestlands are being preserved as the other side of the equation. We believe that as we continue to grow, the state must be willing to help the public better understand the benefits of GMA required density.

Retrofitting

We appreciate the fact that the Water Quality Discussion Paper clearly acknowledges our region has not dealt in any meaningful way with existing (pre- 1995) urban development in most areas. The topic forum paper rightly notes that the majority of existing urban commercial, industrial, residential and transportation infrastructure development occurred before current stormwater management standards. Most scientists will agree that

development in Puget Sound prior to the mid-1990's is playing a significant and ongoing role in Puget Sound's deteriorated health, not just in terms of habitat elimination, but also in terms of untreated stormwater discharge. We view this to be a major gap in our efforts to address stormwater. Unless retrofitted with proper controls, this pre-1995 development provides no or minimal management of stormwater. As such, we strongly support the recommendation to begin or accelerate retrofits of impervious surfaces in untreated urban areas. In fact, we believe applying current regulations and practices to retrofit untreated stormwater runoff coming from public and private development predating current stormwater management requirements should be a top priority, particularly in watersheds with significant existing development. If we are really serious about better managing stormwater runoff to improve water quality and water quantity in our region, then we must be prepared to adequately address runoff from older development. At the same time, we recognize the significant challenges of implementing such a program. Developing a process for prioritizing retrofit projects, identifying funding sources to help pay for them and coordinating with existing property owners will be no easy task. Though expensive, we believe the cost benefit of contaminants removed per dollar spent is likely highest with retrofitting and source control of existing development. Furthermore, attempting to improve the condition of Puget Sound by further increases in regulations on new and redevelopment projects cannot possibly have the cost benefit to aquatic habitat that retrofitting existing development will. The Washington State Department of Ecology's stormwater manual and modern flow control requirements are among the most stringent for managing stormwater from new construction sites in the country. If nothing were done to address stormwater runoff from existing, particularly pre-1995 development, then water quality improvements from those older developments – whether residential, commercial or industrial developments or highways – would be dictated by the rate of redevelopment. It is difficult to predict how long it would take to redevelop the existing pre-1995 built environment, and with such redevelopment bring about upgrades in stormwater management and sensitive area protections. But it would most certainly extend well beyond the Action Agenda's 2020 deadline.

Reuse of stormwater generated from rooftops

We support the recommendation to amend state water rights law to exempt the reuse of stormwater runoff generated from rooftops for non-potable uses. Many, including our association's Built Green® program, promote rainwater collection as an important voluntary tool for addressing urban stormwater issues. Yet under existing water law in our state, the use of rainwater requires a water right permit that can take years to process. As such, current state law acts as another regulatory barrier to low impact development. We believe state water law should be changed to recognize and accommodate

the benefits of rainwater collection from rooftops for those seeking to employ this technique.
Expanding NPDES
We have serious concerns about expanding NPDES Phase II stormwater permits to urban areas below the current threshold. The Phase II municipal stormwater permit is a very complex and costly permit to implement. Moreover, the newly issued Phase II permits have barely begun to be implemented. They will, for the first time, require 102 cities and 13 counties across Washington to implement stormwater management programs. We believe it is unreasonable to suggest expanding the Phase II permit to other jurisdictions, especially before the new permit has been fully implemented.
Protecting intact and high-quality lands and watersheds As supporters of the Cascade Land Conservancy and the Cascade Agenda, we support responsible efforts to protect our most pristine lands. However, we would caution against any effort that would negatively impact buildable land inside urban growth areas. As such, we believe our state needs to adopt a no net loss of buildable lands policy. Such a policy would compensate for the reduction in housing units that necessarily occur any time a new public policy – such as increased wetland buffers in urban areas or increases in stormwater vault sizes – is adopted. Any change that reduces our buildable land supply, and in turn our housing capacity, would have to include measures to increase density in the urban growth area or increase land availability, including moving the urban growth boundary. We believe this change is critical for accommodating our region's expected population growth and encouraging the Growth Management Act's affordable housing goal.
Thank you for considering our comments. I look forward to engaging in further dialogue on these and other issues as development of the Action Agenda moves

From: Stuart Glasoe

Date: 05/06/2008

Comment: Here are our office's comments on the draft water quality paper. Please let me know if you have any questions.

Comments from Washington Department of Health, Office of Shellfish and Water Protection, on Initial Discussion Draft, Water Quality Topic Forum, April 14, 2008

General Comments

Scope and Focus – The paper focuses on urban environments and two pollution sources: municipal sewage discharges and stormwater runoff.

There is little to no discussion of rural areas and issues, nonpoint pollution, shellfish protection, watershed planning, boating issues, farm practices and more. The paper needs to acknowledge and address the full range of environments (urban and rural), pollution sources (point and nonpoint), and management approaches (e.g., watershed management plans, shellfish protection districts) that affect water quality.

Resource Protection, Pollution Prevention – The paper needs to put more emphasis on resource protection and pollution prevention as priority principles and strategies for protecting and restoring the region's valuable water resources. For example, the paper should embrace and advance proven and promising land development and stormwater management techniques that preserve and mimic essential ecosystem functions. Among other edits, Policy Question 2 on page 28 should be titled "Strategies to Protect and Improve Water Quality in Puget Sound" and principle #2 on that same page should be titled "Focus on ecosystem protection and improvement".

Definition of Stormwater Runoff – The paper talks about "stormwater runoff" in very broad terms. The discussion on pages 6-7, for example, suggests that "stormwater runoff" includes runoff from all land surfaces, and the discussion on page 15 suggests that "stormwater runoff" covers all nonpoint sources. The terms "stormwater" and "stormwater runoff" need to be clearly defined and used consistently across all of the Partnership's documents to clarify whether they include all surface runoff or are limited to urban runoff (as defined in the 2000 Puget Sound Management Plan), and whether they encompass all nonpoint pollution sources or are limited to urban runoff sources. Bear in mind that nonpoint sources can contaminate waterways via subsurface flows (e.g., failing shoreline septic systems), direct discharges (e.g., boat waste discharges), or surface runoff.
Regional Data and Examples – The paper uses data and examples that are limited almost exclusively to the Seattle-King County area, and we recommend expanding the view of the paper to include examples and data from elsewhere in the region. For example, the paper discusses land cover change in central Puget Sound on page 8. Land cover data and analyses are available for the entire region, which would make a more powerful statement in this part of the report. Check with the Partnership and other state natural resource agencies for this regional land cover information.

Terminology for Onsite Sewage Systems – Many different terms are used to describe onsite sewage systems, and it creates confusion. We suggest that you use the terms "onsite sewage system" and "large onsite sewage system" in this and other Partnership documents, or you might want to hyphenate the word on-site.

Other Comments

Page 3, Para 5 (Shellfish) – The paper says that over 30,000 acres of shellfish beds are closed to harvest, and this is repeated again on page 5. This should be revised to say that "approximately 30,000 acres of commercial shellfish tidelands have been closed to harvest since 1980 because of pollution" and should reference the 2007 State of the Sound. It's also important to note that the trend for the past 15 years has been positive due to effective protection and restoration efforts across the region (net gain of 8,000+ acres during the period).

Page 4, Para 5 (Threats) – Don't agree that Puget Sound is at greater risk than other estuaries. The other ones have natural barriers and special problems as well.

Page 4, Para 6 (Impaired Waters) – You should be able to update and fill out the regional description of these impairments based on the most recent assessments completed by Ecology.

Page 5, Bullet 3 (Emerging Contaminants) – Recommend adding the point that little is known about the health and environmental effects associated with these pollutants. Please include information on the known effects if available. (Comment also applies to bullet #4 on page 6 and other sections.)

Page 5, Bullet 4 (Groundwater) – Please reference findings on nitrate levels in the state's groundwater in this new USGS report: http://pubs.usgs.gov/sir/2008/5025/pdf/sir20085025.pdf.

Page 5, Para 7 (Pathogens) – The list of sources should be broadened to include stormwater from impervious surfaces, wastewater treatment plants, combined sewer overflows, pets and boats. Loadings from commercial marine traffic is unknown but should be investigated.

Page 7, Para 4 (Stormwater Pollutants) – The list should include "fecal material and pathogens." This is true whether it comes off a parking lot or comes from a farm. Stormwater always has high levels of fecal coliform bacteria and it is safe to assume that people will be exposed to the waters and pathogens.

Page 8, Para 6 (Effects) – This discussion of imperviousness, specifically the significance of the 10 percent level of impervious cover, should be expressed in more cautious terms. The research does suggest that 10 percent

impervious cover and 65 percent forest cover are telling measures at the landscape scale. However, the research also makes the point that increasing development, as measured by a host of landscape metrics and stream- and shoreline-health indicators, is associated with a continuum of environmental effects and these impacts are often measurable at levels of development below 10 percent impervious cover. This seems to be the more important point to stress. That is, you can say with certainty that species diversity (and other indicators of stream- and shoreline-health) will not be universally high at development levels below 10% impervious cover.

Page 8, Para 6 – In addition to ions and dissolved organic carbon, pH and temperature also have an effect on the toxicity of metals.

Page 9 (Author's Request, Ag Practices) – You request material linking agricultural practices with fecal coliform bacteria. You can say the following: "The Washington Department of Health monitors and classifies shellfish growing areas based on the results of comprehensive sanitary surveys. These surveys include water quality sampling, pollution source investigations, and other information. Animal wastes from commercial and non-commercial farms have been identified as pollution sources in many shellfish growing areas in the Puget Sound region, including Dungeness Bay, Samish Bay, Portage Bay and Drayton Harbor."

Page 9, Para 7 (Wastewater) – Suggest changing this to say that "most" sewage treatment plants in the region discharge wastewater directly to Puget Sound, and other plants discharge to rivers that drain to Puget Sound. The Partnership or the Department of Ecology should be able to provide an inventory of municipal treatment plants in the region and their discharge locations.
Page 9 (Author's Request, Wastewater Inputs) – The UW cruise ship study, available at www.doh.wa.gov/ehp/sf/Pubs/cruise-ship-report.pdf, estimated land-based WWTPs contribute nearly 400 million gallons per day into Puget Sound. Where possible, the paper would be strengthened by including loading data for other sources.

Page 10, Bullet 2 (Wastewater Pollutants) – Include nutrients in the list of pollutants. Wastewater treatment plants remove only 10-40% of nitrogen from wastewater and about 400 million gallons per day are discharged directly to Puget Sound. The percentage of nutrient removal is about the same as septic systems, which do not directly discharge into Puget Sound.

Page 10, Bullet 3 (Pathogens) – Add wastewater treatment plants and collection systems (leaks and wet-weather upsets and overflows) to the list

of sources. Also, the last sentence in this paragraph says that failing septic systems are presumed to cause pollution in some locations. You should delete this sentence or convert it to a statement and include a reference. All of the pollution sources listed in the paragraph or elsewhere can cause pollution. To the extent possible, the paper should focus on documented problems to illustrate the points and to gauge the threats and impacts.

Page 10-11, Bullet 6 (Septic Systems) – Here are several points. (1) There are now an estimated 525,000 onsite sewage systems in the Puget Sound region. (2) The last sentence should say that onsite sewage systems, if they are improperly designed or maintained, may be sources of pathogen pollution. (3) We don't know the pathogen and nutrient loading from onsite systems to Puget Sound. (4) We don't know precisely what the systems are capable of doing—limited effectiveness removing all pollutants. Prevention and source reduction are keys to keeping micro-constituents out of the waste stream. (5) Makes sense to better understand and improve treatment for known problems before shifting attention to concerns with other emerging contaminants.

Pages 10-11 (Wastewater Discharges) – It's unclear what the distinction is between the bullet on "wastewater discharges" on page 10 and "wastewater discharges to streams" on page 11.

Page 12, Para 7 (Water Activities) – See the EPA cruise ship assessment at www.epa.gov/owow/oceans/cruise_ships/disch_assess_draft.html, section 2, page 8. In Alaska, only 43% of ships met FC discharge standard of 200 FC/100 ml. Of those that had poor effluent, 5/6 Cruise Ships inspected by Coast Guard either had MSDs that were either improperly used or had failed to maintain them. If big boats with dedicated crews can't maintain MSDs, what does that mean for smaller boats?

Page 13, Para 2 (Marine Traffic) – You'll find more information on the state's ballast water program at www.wdfw.wa.gov/fish/ballast/ballast.htm.

Page 15, Para 1 (Stormwater Runoff) – As explained in our general comments, the first sentence should be reworked to clarify your use of the term stormwater. Stormwater is not the only way that nonpoint sources contribute to pollution. Septic systems, manure, and waste from boaters can be discharged directly into water bodies—no storm or stormwater required.

Page 16, Para 9 (Stormwater BMPs) – This point about the performance of conventional stormwater practices should be inverted. The point isn't that the design and application of conventional BMPs have not been

demonstrated to consistently meet standards. Instead, the research that has been conducted has demonstrated that conventional practices consistently do not meet water quality standards due to many factors, including real-life problems associated with siting, design, construction, operation, maintenance and replacement.

Page 17, Para 2 (LID) – The paper needs to give substantially more attention to low impact development and substantially more credit to the research that has been conducted regionally and nationally on these approaches and practices.

Page 18, Para 1 (Wastewater) – Advanced treatment to remove nutrients is used on a very limited basis in the Puget Sound region (e.g., the LOTT plant in Olympia). As noted previously, septic systems remove about the same percentage of nitrogen as wastewater treatment plants. Nutrient-removal technologies are available, but their use is not standard practice.

Page 18, Para 3, Bullet 1 (MBR Technology) – Two emerging treatment options, membrane filters and UV disinfection, have much better removal efficiencies with bacteria compared with viruses. This renders coliform bacteria a less reliable indicator for viral pathogens from treatment plants employing these methods.

Page 18, Para 3, Bullet 2 (Trace Compounds) – Standard onsite systems with septic tanks and soil drainfields can also remove or reduce certain trace substances.

Page 18, Last Para (Effectiveness) – This section on measuring and documenting effectiveness is focused on stormwater and wastewater, and needs to be expanded and improved to include a broader suite of measures and indicators related to water quality. This should include water quality and classification data for the region's shellfish growing areas, including upgrades and downgrades associated with changes in water quality and related protection and restoration efforts.

Page 19, Para 3 (Gaps) – Add a bullet regarding the need for expanded water quality modeling to inform monitoring needs and plans.

Page 19, Para 3 (Gaps) – We need to better understand options, techniques and incentives to turn stormwater and wastewater into reclaimed water.

Page 19, Para 3, Bullet 3 (Gaps) – Technologies are approved and available for nitrogen removal. A move to AKART would push the use of advanced

wastewater treatment technologies.

Page 20, Para 1 and following (Approaches) – This introduction—actually the entire section—should be expanded to more fully describe the institutional framework for protecting and restoring water quality. This includes management of point sources, nonpoint sources, and other related approaches. The point source discussion should include, for example, the State Clean Water Act in addition to the federal act. The nonpoint discussion should include state and local laws and programs for managing onsite sewage systems, boat wastes, farm animal wastes and other nonpoint sources (e.g., state onsite sewage rules, Thurston nonpoint ordinance, Whatcom nutrient management ordinance, Kitsap PIC program). These pollution programs are complemented and supported by requirements for land use planning (GMA and local comprehensive plans and development regulations), shoreline management (SMA and local shoreline master programs), shellfish protection (National Shellfish Sanitation Program, shellfish protection districts, closure response strategies), water cleanup plans (TMDLs) and watershed management plans. It all ties together for comprehensive management and protection of water quality, and the paper should reflect and explain this.

Page 20, Bullet 1 (Stormwater) – Here or elsewhere you should mention that local governments have established different kinds of local utilities to fund a variety of projects and services to protect and restore water quality. This includes programs and fees for wastewater treatment, stormwater management (stormwater utilities), shellfish protection (shellfish protection districts), resource conservation (conservation district special assessments) and other needs. In many cases utilities have been set up to address issues and fund local programs in a coordinated fashion (e.g., Kitsap surface and stormwater management program, and Skagit clean water district program).

Page 21, Bullet 2 (Wastewater) – The bullet on rural sewage issues should note that local health jurisdictions are required to adopt onsite sewage management plans. This includes requirements to identify and protect marine recovery areas. To date, DOH has approved plans for 10 of the 12 local health jurisdictions in the Puget Sound region.

Page 21, Wastewater – Consider adding a bullet recognizing the fact that shellfish protection districts and shellfish closure response strategies have been adopted and developed at numerous sites around the Sound helping to successfully protect and restore water quality and upgrade the classification of many shellfish areas.

Page 22, Limitations – In the 2006 session the legislature called on local health jurisdictions to develop onsite sewage management plans and to designate and carry out additional activities in marine recovery areas. The legislature provided some funds for the plans, but none to carry out the new work. This work needs dedicated funding.

Page 22, Bullet 4 (Limitations) – Funding needs extend beyond enforcement and outreach. Nearly all local jurisdictions lack funding to implement comprehensive water quality programs. Kitsap County is one county that seems to have adequate funding to monitor nonpoint sources and drainages into Puget Sound.

Page 22, Bullet 3 (Stormwater) – This sentence is confusing. What are you saying is not planned together? Whatever it is, be more precise and recognize that there are examples where these items are being planned together to varying degrees.

Page 23, Bullet 1 (Stormwater) – These pollution threats are partially and indirectly addressed by requirements to control suspended solids.

Page 23, Para 6 (Wastewater) – Advanced treatment for nutrient removal by municipal treatment systems, large onsite systems, or small onsite systems is not standard practice at this time and represents a significant challenge for the region. The technologies are available, but are not widely used.

Page 23, Bullet 1, Sub-Bullet 2 (Wastewater) – This point talks about funding WWTPs in non-urban areas. This is confusing because there centralized WWTPs only serve urban areas. Are you referring to small or isolated developed areas that may be LAMIRDs or UGAs, such as Hoodsport and Belfair in Mason County? If so, then it would be helpful to describe such areas in these terms, or if you are referring to other areas or situations, please explain.

Page 23, Bullet 1 (Wastewater) – Suggest adding another bullet to point out that funding and other incentives for repairing, replacing and maintaining onsite sewage systems—and also for connecting onsite systems to municipal STPs or for consolidating onsite systems to form a large onsite system—is even more limited than funding for centralized systems. The decentralized wastewater infrastructure deals with other related barriers associated with private ownership of the systems and the lack of coordinated planning to guide infrastructure investments.

Page 24, Bullet 1 (Wastewater) –This paragraph refers to municipal systems,

but it raises questions for all types and scales of sewage systems. The list of challenges should include the fact that there are no state or federal requirements to remove the compounds, sampling protocols are not always reliable, and there's very limited knowledge regarding the nature and extent of the problem. Also, is it appropriate to refer to pharmaceuticals as toxic compounds?

Page 24, Bullet 2, Sub-Bullet 1 (Wastewater) – While not required to include reuse, water systems with over 1,000 connections are required to evaluate reclaimed water opportunities when doing their period water system plan.

Page 24, Bullet 2 (Wastewater) – Add a sub-bullet regarding the need to develop a customer base for use of reclaimed water. Presents an opportunity to use social marketing. This point applies to other parts of the document, e.g., Page 29, Bullet 1.

Page 24, Bullet 3 (Wastewater) – The cost of providing treatment to achieve reclaimed water standards may be modest for new facilities, but can be very pricey when retrofitting existing systems.

Page 25, Bullet 1 (Wastewater) – The issues described in this paragraph are vague and unclear. For example, what is the issue that you are drawing attention to regarding the inconsistency involving outfalls? Also, while DNR may have an interest in treatment levels and marine discharges, there are many agencies and organizations with an interest in these issue, so it seems misleading to say that DNR is driving these issue.

Page 25, Bullet 2 (Flow Blending) – The Department of Health and the Department of Ecology are on record of opposing flow blending. Flow blending does not encourage wastewater utilities to find inflow and infiltration into their collection systems. This results in more numerous bypasses of inadequately treated wastewater, which contaminates shellfish beds and swimming beaches.

Page 25, Combined Sewer Overflows – The discharges from CSOs are highly contaminated with pathogens that threaten the safety of shellfish and swimming beaches. Although they may happen infrequently, the threat to public health is substantial. CSOs need to be eliminated.

Page 25, Wastewater, Onsite Systems – (1) Regarding the first bullet, current state rules do contain a nitrogen standard. The new rules for large onsite systems will include a standard as well. (2) Regarding the second bullet, siting does have to take into account the receiving waters if deemed

necessary. The new rules for large onsite systems will include the same requirements. (3) Regarding the third bullet, or more specifically sub-bullet 2, the authorizing statute (RCW 70.118, 118A and 118B) and related rules (WAC 246-272A and B) do not include new authority or requirements for onsite sewage utilities.

Page 26, Para 1 – The requirements in the 2006 legislation are reinforced and spelled out in more detail in the State Board of Health Rules. Among other provisions, the rules call on local health jurisdictions to adopt onsite sewage management plans. This includes requirements to identify and protect marine recovery areas. To date, DOH has approved plans for 10 of the 12 local health jurisdictions in the Puget Sound region.

Page 26, Bullet 2 (Direct Marine Pollution) – Cruise ships are a small percentage of the Sound's marine traffic. While the US Coast Guard has the authority, they do not exercise it in any way that can be considered effective. The number of inspections per year is extremely low. They do not monitor the performance of MSDs on marine vessels, which have much poorer performance than advanced wastewater treatment systems on cruise ships.

Page 26, Bullet 3 (Direct Marine Pollution) – No agency is taking a comprehensive look at pumpout use/maintenance, so this is similar to the Coast Guard comment (facilities there, but no one sure how well they work).

Page 26 (Author's Note, Land Use Planning) – The land use/habitat paper does not appear to address land use in broad terms, but instead addresses it only as it pertains to habitat. As such, the water quality paper needs to address land use issues as they pertain to protecting and restoring water quality.
Page 26, Bullet 1 (Land Use Planning) – The bullet says that GMA advances integrated land use and water resources planning to the extent critical areas are specifically addressed. What does this mean, and what is it based on? Good land use planning and protection of water quality are not limited to critical areas. Critical areas and natural resource lands may require enhanced protection, but that does not mean that other areas get no protection. One of the goals of GMA is to "protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water."

Page 27, Para 2 (Comprehensive Watershed Planning) – This paragraph is confusing. If you are talking about watershed-based NPDES stormwater permitting, then it's fair to leave the impression that this is a new tool that could be used in the Puget Sound region. However, if you are talking more generally about watershed planning, the Puget Sound region has 20 years of

experience and hundreds of watershed management plans. We are plan rich, action poor.

Page 28, Para 1 (P2) – The narrow scope of the paper is underscored with this opening sentence: "Water Quality threats associated with our approach to urban living are ubiquitous." Again, the paper should address threats, issues and approaches across the region, not just in urban areas.

Page 28 (Principles) – The first principle should be to "prevent the contamination of areas with healthy watersheds, functioning habitats and clean water." Protection is always easier and cheaper than restoration. The cost of protecting the region's most pristine watersheds could well be cheaper than cleaning up one contaminated urban bay. The principles should support and advance programs that have proven success, that focus on pollution prevention and resource protection, and that address the root causes of problems, not symptoms.

Page 29 (Stormwater) – Add language to help advance development/building and stormwater management practices that emphasize the principles and practices of low impact development, especially the principles that call for the protection of land cover, soils and buffers that are essential to preserving the integrity of parcels, drainages and watersheds. Once trees are cleared and soils are compacted, the potential to mitigate the impacts of development on water resources are limited.

Page 30, Bullet 1 (Wastewater) – Making the jump to tertiary treatment and reuse at all WWTPs may be desired or needed, but it probably doesn't qualify as a short-term goal.

Page 30, Bullet 3 (Wastewater) – (1) This section incorrectly references a sewage utility law. The authorizing statutes for onsite sewage systems are RCW 70.118, 118A and 118B, and the related rules are WAC 246-272A and B. The 2006 legislature amended the statute when it passed HB 1458. Among other provisions, HB 1458 called on local health jurisdictions to adopt plans to improve the overall management of onsite sewage systems. Utilities can perhaps serve a role helping local health jurisdictions carry out this work, but utilities are not mentioned in the bill. (2) The rule is designed to protect both public health and environmental quality. The rule does not require nutrient removal. It sets a treatment standard and framework that locals can use if they choose to require nutrient removal. (3) Successful implementation of the local plans and programs will require effective and ongoing social marketing to change perceptions and behaviors regarding long-term use and maintenance of onsite sewage systems.

Page 31, Para 1 (WWTP Outfalls) – With respect to the issue of decommissioning outfalls, consider adding more information on the policy options and related discussions regarding outfall extensions.

Page 31, Bullet 1 (Land Use) – The call to protect high quality lands and watersheds is good, but seems to miss the mark a bit. While groups such as the Nature Conservancy can play an important role, the focus needs to be on local governments to ensure that local land use plans, development regulations and related programs and services are well designed and fully implemented to deal with both existing development and future growth.

Page 32, Bullet 1 (Recommendations) – If sediment is considered a priority water quality issue, you should expand this to recommend examining the effects of resuspended sediments on bacterial levels in shellfish growing areas. (See Newton et al 2007 for a brief description of this issue; also staff at the Squaxin Tribe have done a literature review on this topic.)

From: Andrew Cook

Date: 05/06/2008

Comment: Attached are the Building Industry Association of Washington's comments to the topic forum papers. Please let me know if you have any problems opening the attachment. A hard copy is being mailed to the Partnership as well.

Attached: BIAW Comments - Topic Forum Papers.pdf

From: Doug Levy

Date: 05/06/2008

Comment: Water Quality Paper

*P. 29 - Stormwater Treatment Retrofit Recommendation -- I'm very concerned with the Recommendation that there should be Stormwater Treatment Retrofit where either no treatment "or inadequate treatment" exists. In terms of adequately measuring criteria, who is defining 'inadequate'? That could mean different things to different people and potentially could have huge fiscal implications for local governments. The recommendation is also disingenuous in that is categorized as high "not including funding considerations" -- an admission that it could be cost-prohibitive. While there is no question that stormwater control will be an

important part of the water quality equation with respect to Puget Sound, again, we need to stay focused, and realistic, and adopt plans that are achievable and affordable.

*Recommendations -- Wastewater -- Require Tertiary Treatment -- This recommendation, again, could have huge cost implications. I think it's important we say that. At least in this case, the authors of the paper acknowledge the magnitude of the cost factors.

In closing, thank you for the opportunity to comment on these Issue Papers. Cities I represent recognize the extraordinary importance of cleaning up and restoring Puget Sound, and producing an Action Agenda that can make a difference. We look forward to working with you.

From: Tracy L Fuentes

Date: 05/06/2008

Comment: Attached please find a first set of USGS comments on the human health, water quality, and water quantity topic forums. We will provide input on the habitat/land use and species/biodiveristy topic this week. We may also provide additional comments on water quantity and water quality. Comments are from Patrick Moran, Rick Dinicola, Tony Paulson, and Rich Sheibley.

Thank you for the opportunity to participate in developing the Puget Sound Parntership's Action Agenda.

Regarding the Water Quantity topic forum, please incorporate USGS Water Science Center publications on the Puget Sound aquifer into your analysis:

Jones, M.A., 1999, Geologic framework for the Puget Sound aquifer system, Washington and British Columbia: U.S. Geological Survey Professional Paper 1424-C, 31 p, 18 Plates.

Vaccaro, J.J., Hansen, A.J., and Jones, M.A., 1998, Hydrogeologic framework of the Puget Sound aquifer system, Washington and British Columbia: U.S. Geological Survey Professional Paper 1424-D, 77 p.

From: Tami Ishler

Date: 05/06/2008

Comment: Water Quality Topic Forum

Aquatic Resource Division Comments
General Comments
• The draft report does not clarify a concise definition of the integrated concept of "water quality;" this would serve the rest of the report and found the basis for the Partnership's approach to dealing with water quality issues.
• Analysis of water quality problems should examine new and emerging pollutants, while also maintaining focus on long-term pollutants.
• Existing efforts to deal with water quality (buffers, treatments, etc.) should be examined for effectiveness in order to guide future activities (i.e., build on successes, avoid past failures); the Partnership would be well-served to complete an analysis of cost-implications vs. direct water quality gains, helping to prioritize possible actions and provide guidance for the entire Puget Sound.
• Solutions to water quality problems, and the devotion of funds, should seriously examine the trade-off between the precautionary principle and late-stage cleanup. Often it costs much more to deal with a problem after it has inflicted harm, than to deal with preventing it in the first place.
• The interface, and differences, between fresh water and marine water quality issues should be clarified.
• The role of climate change and potential sea-level rise in impacting water quality should be highlighted.
• Impacts from storm water and combined sewer overflows remain one of the primary drivers for poor water quality.
• The role of land-use and development should be examined for potential implications on future water quality for local jurisdictions; promoting low-impact development (LID) could benefit water quality impacts from new development and urban expansion.
• Pg. 8 (and others): The links between water quality, species and habitat need to be more broadly considered. For example, "Effects of Stormwater Pollutants on Species" is limited to freshwater systems and adult salmon. Effects on other life stages should be included, such as work done by R.M Kocan on embryos and larval development (see: http://www.fish.washington.edu/people/kocan/publications.html).

Detailed Comments
• Pg. 16: S2-A: More detailed discussion is needed on the pros and cons of the current concentration-based discharge standards versus the TMDL approach.
• More information is needed on the effects of eutrophication. Include references to and discussion of green tides (macroalgae) and shifts in biota, (ie., work by Ron Thom, Tim Nelson) and the literature on bottom-up control of food webs. Another example: Bricker, S., B. Longstaff, W. Dennison, A. Jones, K. Boicourt, C. Wicks, and J. Woerner. 2007. Effects of

Nutrient Enrichment In the Nation's Estuaries: A Decade of Change. NOAA Coastal Ocean Program Decision Analysis Series No. 26. National Centers for Coastal Ocean Science, Silver Spring, MD. 328 pp. http://ccma.nos.noaa.gov/publications/eutroupdate/
• Information is available from USGS on groundwater discharge (estimate 10-15% of water entering Puget Sound comes from groundwater seeps/springs. For example, see Tony Paulson's report to the PSAT.
• S2-B: Includes a buried jewel: "Historically land use planning has not been strongly influenced by the provision for water supply, wastewater treatment, or stormwater management from an ecological perspective. More typically, land use decisions determined how water supply, wastewater disposal, and stormwater management would occur." This information needs to be taken to its logical conclusion. Specifically, more emphasis is needed on the recommendation that the solution is going to be a systems approach, including land use, water use, source control, chemical use regulation (inputs).
• A bibliography is needed.

From: Dan Stonington

Date: 05/06/2008

Comment: Cascade Land Conservancy, along with coalition partners throughout the Central Puget Sound Region and over the Cascades, launched The Cascade Agenda in 2005. The Agenda is a 100-year vision and set of strategies for conserving 1.3 million acres of working and natural lands, and creating vibrant, livable urban centers to house the population growth coming to the region.
Stakeholders created The Cascade Agenda in part to protect our waterways and Puget Sound. Conservation and 'smart growth' have substantial benefits for water quality because they reduce the percentage of impervious surface in a watershed and decrease stormwater runoff.

The following comments on the Land Use, Water Quality, and Human Health Topic Forum papers expand upon this theme: what happens uphill impacts Puget Sound downhill and land conservation and smart growth are two of the most effective preventive strategies available. These comments do not address the Water Quantity and Species/Biodiversity papers because these papers reference the other Topic Forums for information on the impact of land use policies on Puget Sound.

The authors and 'core groups' for all of the papers do a good job of stating the connection between land use and Puget Sound health. There are also

opportunities in the papers, highlighted in the comments below, to clarify and strengthen this important connection.

Water Quality Topic Paper

- Pg 8 – The information on urbanization and stormwater would be stronger with more context on the degree to which growth is happening outside the UGA. Under the "urbanization" paragraph, the document could include the following sentence: "Significant growth continues outside the Urban Growth Boundary. In Pierce County, approximately 20% of the growth between 2000 and 2007 was outside the UGA. In Kitsap, between 40 and 60% of growth has been outside the UGA in recent years." Source: Puget Sound Regional Council, Puget Sound Trends, April 2008 http://www.psrc.org/publications/pubs/trends/d5apr08.pdf
- Pg 15 – The list of stormwater source control measures on this page could include "conservation and smart growth strategies"
- Pg 17 – The document correctly lists out "limitation on impervious surface, and protection of ecologically functional areas" as an area that needs more findings. These findings should comment on the cost effectiveness of using conservation and smart growth as stormwater prevention strategies as compared to treatment.
- Pg 21 – The end of the list of existing regulatory or management programs for addressing stormwater could include, as an example, the stormwater benefits of preventing development on the 90,000 Snoqualmie Tree farm through King County's transfer of development rights from that property.
- Pg 31 – Add a bullet under the Land Use section that states "concurrent with employing conservation strategies for undeveloped portions of watersheds in the Puget Sound basin, pursue strategies to direct growth into urban areas and foster a high quality of life in urban areas to provide a positive alternative to low-density growth on rural or resource lands. Match these growth strategies with a range of techniques for Low-Impact Development and green infrastructure in urban areas."

From: Robert Cusimano

Date: 05/05/2008

Comment: Water Quality Topic Forum "White Paper"
Comments by T. Gries, 4-29-08

I have briefly reviewed this document and offer these comments in response to the following questions asked of reviewers. I've not been so brief in my comments. Sorry.

Science Q 1 Status of Water Quality in Puget Sound

1. There is no discussion of what is likely to be high uncertainty associated of 303(d) waterbody listings based on sediment quality.

2. "Mixed findings on sediment contamination in freshwater".

Section underemphasizes risk associated with exposure of organisms to contaminants in freshwater sediments. This is because existing freshwater sediment quality guidelines (SQGs) are based on acute effects in very few surrogate test species. These chemical SQGs are not based on chronic or sublethal effects or any direct assessment of native benthic communities. Therefore they are unlikely to protect many native organisms.

3. "Emerging Contaminants (Endocrine Disruptors, Pharmaceuticals and Personal Care Products)".

I have personally tried for >3 years to have these emerging contaminants measured in Puget Sound sediments, initially in areas where they are most likely to be found. We still have virtually no knowledge of their presence or potential effects on benthic or higher trophic organisms. So the text herein needs to better highlight these uncertainties.

4. "303(d) Listings".

Same comment as first on in this section.

5. "Endocrine Disrupting Chemicals".

Same comment as for #3. While there is beginning to be a systematic search for these compounds in waters , especially thise likely to receive dischareges from municipal wastewater treatment plants, the same has not occurred in sediments where these compounds may be expected to accumulate and have consequences on a variety of aquatic biota.

6. "Sediment Quality. The available scientific evidence, combined with the regulatory assessments conducted by Ecology under their Clean Water Act responsibilities, generally supports a conclusion that marine sediments in localized areas of Puget Sound are contaminated."

This is an understatement of current knowledge of and uncertainties about sediment quality in Puget Sound (based on nearly 20 years experience in this

area). For example, it does not address the fact that we know very little about the risk to biota from chronic exposures to tributyltin or risk to humans from dermal exposures to chlorinated dioxins/furans in sediment or through consumptive pathways.

7. "Authors/Reviewers request more information on the contribution of existing contaminated sites to the overall loading."

This is insightful. Knowing the answer to this question would be extremely useful to regulators, policy makers and the general public. It would lead to a more informed sense of priorities for sediment cleanup programs and projects, as well as more informed decisions on how to manage contaminated sediments.

8. "Stormwater Runoff …"

There is no discussion of why we know relatively little about how stormwater loading of toxics impacts localized sediments. With the exception of King County, almost all environmental sampling to assess stormwater impacts to sediments has involved water quality monitoring, catch basin/trap sediment monitoring. Seldom assessment of sediment quality immediately surrounding stormwater outfalls. There is a large uncertainty about stormwater effects on sediment quality here.

"Sediment cleanup: Numerous water and lands recorded as contaminated are requiring cleanup under CERCLA regulations (USEPA, 2008a)."

Does little to summarize actions taken or not taken, successes and lack thereof. Perhaps this discussion belongs elsewhere, but … Could mention that few if any cleanup actions have been taken primarily because of stormwater loading, and that stormwater loading is recontaminating more than one major cleanup site.

"Gaps in knowledge"

How to evaluate sediment quality, and risks associated with it, are not even mentioned here. This despite a long laundry list of gaps in our knowledge that could be generated.

Science Q 2. Management Approaches Addressing Water Quality

9. "Contaminated Sediments [Authors suggest an analysis of the effectiveness of cleaning up contaminated sediments relative to cost, and

under what conditions. Issues include historic liabilities and the potential for Puget Sound-wide regulatory agency alignments on strategies, limitations of liabilities and prioritized mitigations.]"

Could summarize successful cleanup actions along with costs/benefits (information is available). There is a lot of historic knowledge about a Puget Sound-wide (interagency) cooperative sediment management program (CSMP) that has fallen by the wayside over the past 6-8 years. There is also information about how cleanup site identification and actions have been prioritized. How often have they been based on actual risk analysis or an analysis of sites themselves being sources of contaminant loading?

10. How is the effectiveness of management techniques measured and documented?

A minor reference is made to availability of various agency reports … But has there been independent evaluation of the overall effectiveness of various programs? This text provides to serious analysis of or insights into the effectiveness of various programs or their respective measures of success? Do they really protect or improve Puget Sound or merely document ongoing activities that may or may not benefit Puget Sound?

12. Gaps in our understanding.

Bullets 1 and 2 can easily be applied to sediment quality too.

Policy Q 1. Policy Approaches to Address Water Quality in Puget Sound

13. "Sediments. Federal and state cleanup programs administered by the EPA or Ecology under CERCLA, RCRA, and MTCA address contaminated freshwater and marine sediments through voluntary and mandated cleanup programs. These programs address the threat of sediments containing a number of legacy contaminants that impact water quality and can bioaccumulate in aquatic organisms."

This text matter-of-factly claims these program "… address the threat of sediments…" without any documentation as their effectiveness. Text does not mention Sediment Management Standards as important to effecting many sediment cleanup actions. Also does not mention SMS in context of providing authority to conduct sediment investigations to help control sources of contamination - provisions that have been applied almost exclusively to large industries and not municipal wastewater, stormwater or CSO discharges.

14. "Limitations of existing programs".

Bullets 1 and 5 apply well to sediment management programs too. There is no discussion herein of limitations of existing sediment cleanup programs. Many experts would claim there are many limitations. Examples include: long-needed clarifications of authorities, amendments to regulations and rule language; long-recognized need for new policies and legal interpretations; out of box thinking on regulatory processes to accelerate and bring down costs of cleanup actions; better training for staff.

Policy Question 2 (P2): Strategies to Improve Water Quality in Puget Sound

15. "The goal of improving water quality in Puget Sound by the year 2020 will require thoughtful consideration of the projects and programs most likely to move us toward that goal without losing ground on the stressors that continue to act on the ecosystem, including population growth and land conversions."

How will regulatory program and more regional/local program activities be prioritized? The preliminary principles are good ones but they don't seem to address how priorities will be set.

16. Preliminary recommended near-term strategies.

There are a lot of good recommendations herein.

Stormwater.
I would add to this section the funding major urban jurisdictions to implement rigorous street sweeping/vacuuming programs. Preventing particulate-phase contaminants from entering stormwater is much more cost-effective than any treatment strategy.

I would add that there are also many near-term strategies that would improve the effectiveness of sediment cleanup program activities. Two examples: amending the SMS rule to clarify many areas of rule language, adding missing sections, updating the scientific underpinnings of the rule; carefully prioritizing which cleanup sites are investigated and receive substantial agency/staff focus (and documenting same).

17. Regulatory strategies. Stormwater, wastewater, and land use. Source control.

To the Regulatory Strategies section I would add serious consideration of a more meaningful (if still carefully prioritized) implementation of the source control provisions in the SMS rule.

18. Recommendations for further assessment. There are gaps in our current understanding of the nature and transport of pollutants that cause water quality impairments and ecological harm. To lessen these gaps and move forward in our scientific understanding so that our strategies become more effective, the team has assembled the following preliminary list of recommended actions for discussion by the working group:

Evaluate the role of sediment in water quality issues to better define the relative contribution of previously contaminated sediment to the overall health of Puget Sound, including the effectiveness of sediment cleanup programs, recontamination issues, and source control program effectiveness. Focus of the analysis would include the mechanisms for contaminated sediments presenting threats to the ecosystem and related risks, and the relative effectiveness of current regulatory programs in effecting cleanups opposite the cost of arriving at cleanup agreements. In addition, this analysis would include an evaluation of sediment cleanup standards for protectiveness of aquatic ecosystems, and development of protective freshwater sediment standards. In particular, there may be opportunities for expediting cleanup efforts that move public funds from contentious to cooperative efforts."

An EXCELLENT paragraph. Hopefully, the working group may eventually address many of the comments I make above. I might also add re-invigorating and strengthening the concept of the CSMP and establishing an independent technical and policy review committee to oversee programs and prioritization of their actions.

19. How will we know when we're making progress?

Periodically measuring (monitoring) the body burden (tissue contaminant levels) in a suite of aquatic organisms could be very key here.

Reducing the number of highly contaminated sites may be one indicator of progress. But with discovery of new sites this may not be the best performance measure. And what is considered highly contaminated can shift. Perhaps acres of sediment actually remediated?

Water Quality Topic Forum – Initial Discussion Draft
Comments – Maggie Dutch, WA Dept of Ecology, 4-23-08

Science Question 1 (S1): Status of Water Quality in Puget Sound

- Page 6 – Sediment Quality

o This information on the status of sediment quality is a poor summary of the body of existing work. It is vague (e.g., "a conclusion that marine sediments in localized areas of Puget Sound are contaminated."), contains incorrect information (e.g., "A large-scale survey undertaken by NOAA and Ecology in 2005 showed widespread contamination but at levels less than regulatory criteria…"), and does not include most of the relevant literature available on this subject.

This appears to have been written by someone who is unfamiliar with the sediment monitoring work being conducted in Puget Sound, and who did a very cursory skimming of the literature to pull this information together.

o I would augment the information in this section with the following information:

? Puget Sound-wide sediment quality monitoring has been conducted by the Washington State Department of Ecology for the Puget Sound Assessment and Monitoring Program (PSAMP) since 1989. Relevant data summaries include the following:

Long, E., M. Dutch, S. Aasen, K. Welch, and M.J. Hameedi. 2003. Chemical Contamination, Acute Toxicity in Laboratory Tests, and Benthic Impacts in Sediments of Puget Sound: A summary of results of the joint 1997-1999 Ecology/NOAA survey. Washington State Dept. of Ecology Publication No. 03-03-049, Olympia, WA and National Oceanic and Atmospheric Administration, Technical Memo No. 163, Silver Spring, MD. 101 pp. + appendix.*
Long, E., M. Dutch, S. Aasen, K. Welch and M.J. Hameed. 2005. Spatial extent of degraded sediment quality in Puget Sound (Washington State, U.S.A.) based upon measures of the sediment quality triad. Environmental Monitoring and Assessment 111: 173-222.
Long, E., M. Dutch, S. Aasen, and K. Welch. 2004. Sediment Quality Triad Index in Puget Sound. Washington State Dept. of Ecology Publication No. 04-03-008, Olympia, WA.
Llansó, R.L., S. Aasen, and K. Welch. 1998. Marine Sediment Monitoring Program - I. Chemistry and Toxicity Testing, 1989-1995. Washington State Department of Ecology, Olympia, WA. Publication No. 98-323. 101 pp. + appendices.

Llansó, R.L., S. Aasen, and K. Welch. 1998. Marine Sediment Monitoring Program - II. Distribution and Structure of Benthic Communities in Puget Sound, 1989-1993. Washington State Department of Ecology, Olympia, WA. Publication No. 98-328. 114 pp. + appendices.

Partridge, V., K. Welch, S. Aasen, and M. Dutch. 2005. Temporal Monitoring of Puget Sound Sediments: Results of the Puget Sound Ambient Monitoring Program, 1989-2000. Washington state Department of Ecology Publication 05-03-016.
Dutch, M., V. Partridge, S. Aasen, and K. Welch. 2005. Changes and Trends in Puget Sound Sediments: Results of the Puget Sound Ambient Monitoring Program, 1989-2000. Washington State Department of Ecology Publication 05-03-024.
Other sediment quality reports generated by Ecology for the PSAMP can be found at http://www.ecy.wa.gov/programs/eap/psamp/index.htm.
? Ecology also periodically prepares a Sediment Cleanup Status Report (http://www.ecy.wa.gov/programs/tcp/smu/sediment.html) which provides information on the extent of contaminated sediments in urban waterbodies, and progress on cleanup efforts.
? Other Puget Sound sediment monitoring reports have been generated by King County DNR and can be found at http://dnr.metrokc.gov/wlr/waterres/marine/index.htm.

o Ecology's use of the Sediment Quality Triad Index in interpreting PSAMP baseline sediment data has indicated that:

? Approximately 33% of Puget Sound sediments show intermediate degradation in either one or two of three measured sediment quality parameters (i.e, chemical contamination and/or toxicity above WA State Sediment Management Standards, or degraded benthic community structure), while approximately 1% shows degradation of all three sediment quality parameters.

? The majority of degraded sediments (based on the Sediment Quality Triad Index) are located in Central Puget Sound and the Whidbey Basin, and are concentrated in the urban embayments and harbors.

? Long-term sentinel stations monitored annually throughout Puget Sound from 1989-2000 displayed an increase in levels of PAH contamination and a decrease in levels of metals contamination in some locations.

Science Question 2 (S2): Management Approaches Addressing Water Quality

- Page 18 – Contaminated Sediments

o I would agree that the effectiveness of cleaning up contaminated sediments relative to cost should be analyzed. Recontamination of sites after clean up should be included in this analysis. In the future, emphasis should be given to pollution prevention and source control as well as cleanup of contaminated sediments.

Policy Question 1 (P1): Policy Approaches to Address Water Quality in Puget Sound

- Page 21 – Sediments

o In addition to listing the currently mandated sediment cleanup programs, the current sediment monitoring programs should also be listed. These would include the PSAMP Sediment Monitoring Component, which is providing a picture of both the spatial extent (km2) of sediment contamination throughout Puget Sound, and an indication of change in sediment quality over time (i.e., is sediment contamination getting better, worse, or remaining unchanged?). The Department of Ecology is also currently conducting its Urban Waters Initiative, including a monitoring program to determine whether sediments in Elliott Bay/Lower Duwamish and Commencement Bay are getting better, worse, or remaining unchanged over time on a bay-wide scale.

- Page 22 – B. Limitations of existing programs, last bullet

o Washington State Sediment Management Standards were adopted in 1995. It is widely recognized amongst the scientific community that sediment quality standards for various chemical contaminants are in need of revision based on newly acquired data. It is also recognized that the Benthic Infaunal Index in these standards is inadequate. Development of an accepted Benthic Infaunal Index is critical for adequate evaluation of the health of invertebrate communities that live in Puget Sound sediments. Puget Sound is one of the few large estuaries in the nation without such an index.

Policy Question 2 (P2): Strategies to Improve Water Quality in Puget Sound

- Page 32 – D. Recommendations for further assessment

o Evaluate the role of sediment in water quality issues – I would expand this paragraph to include examination of sediment quality conditions at the

"urban bay-scale".

o I am in complete agreement that an evaluation of current sediment cleanup standards for protectiveness of aquatic ecosystems is needed, as indicated above. Washington State Sediment Management Standards were adopted in 1995. It is widely recognized amongst the scientific community that sediment quality standards for various chemical contaminants are in need of revision based on newly acquired data. It is also recognized that the Benthic Infaunal Index in these standards is inadequate. Development of an accepted Benthic Infaunal Index is critical for adequate evaluation of the health of invertebrate communities that live in Puget Sound sediments. Puget Sound is one of the few large estuaries in the nation without such an index.

- Page 34 – How will we know when we're making progress?

o I am in complete agreement that "The only way we will know that progress is being made to improve water quality in Puget Sound is to measure it against baseline conditions."

o This section should acknowledge that the Puget Sound Assessment and Monitoring Program (PSAMP) provides extensive water and sediment quality data throughout Puget Sound. This program, which has existed since 1989, should be expanded upon and adequately funded. The PSAMP Sediment Monitoring Program currently has long-term monitoring in place throughout Puget Sound, is capable of indicating the spatial extent (km2) of sediment quality both regionally and Puget Sound-wide, and can assess change over time. This program can also be expanded to include assessment at the bay-wide scale.
Water Quality Topic Forum – Initial Discussion Draft
Comments – Dave Hallock, WA Dept of Ecology, 4-18-08

• Page 4 says "Three general categories…affect water quality…" These are listed as nutrients, pathogens, and toxics. This phrasing implies that these three categories are the major ones, if not the only ones. Categories arguably even more critical in freshwater systems have been omitted (sediment and temperature, in particular). My understanding is that these were to be covered by the "habitat" report, but the water quality report should acknowledge them and explain why they were not included.

• Page 4 also states "Overall trends in water quality for freshwater systems in Puget Sound are difficult to determine due to the lack of consistent data at the same sampling locations over long enough periods of time." We have many years of consistent data from all major streams entering the Sound.

Two important water quality components we are lacking, however, are stormwater/runoff event monitoring, which are necessary for accurate load calculations, and a randomized design monitoring program necessary for an overall assessment of water quality of smaller streams.

• There are numerous references to Class A standards, usually in relation to wastewater treatment. The authors should be aware that technically, those standards no longer apply. Washington's water quality standards are now "use based" and the relevant terms would be something like "suitable for 'core summer habitat' and 'primary contact recreation.'" However, "Class A" is widely understood, and it's sure easier to say.

• Page 33 recommends evaluation of water quality standards and defining site-specific criteria. By statute, Ecology reviews standards every 3 years ("The Triennial Review") and the new use-based standards are more amenable to site-specific criteria. The next review should begin within a year. It's a public process and PSP players are encouraged to provide specific recommendations.
Dave Hallock/EAP

Water Quality Topic Forum – Initial Discussion Draft
Comments – Mindy Roberts, WA Dept of Ecology, 4-18-08

I have several additions that I'll bring with me to the topic forum, but here are the big picture, critical pieces that we should weigh in on sooner rather than later:

• Citations are missing from the document
• Page 4, second paragraph from bottom: "Overall trends in water quality for freshwater systems in Puget Sound are difficult to determine due to the lack of consistent data at the sampling locations over long enough periods of time." This is not true, since Ecology has over 20 years of consistent monitoring data at some key locations, including the mouth of the Deschutes River. As an example, the increasing trend in summer dissolved inorganic nitrogen concentrations was included in a paper done last year-- citation: Roberts and Pelletier. 2007. Interim Results from the Budd Inlet, Capitol Lake, and Deschutes River Dissolved Oxygen and Nutrient Study. Georgia Basin/Puget Sound Research Conference, Vancouver, BC. We can fix this in the topic forum paper, but it's interesting that the rest of the water quality community doesn't know what we have done. See final bullet.

• Page 18, first paragraph under Wastewater: "Most larger facilities are operated to remove some nutrients, primarily nitrogen…." Not true-- nutrient

removal is specifically designed to do just that, and secondary treatment and disinfection do not reduce effluent concentrations to levels considered "low" by ambient environmental standards.

• Page 23, first paragraph under Wastewater: "…(removal of nutrients) has become fairly standard practice…." Not true-- while we know technically how to do this, there is no mandate to institute nutrient removal everywhere, and LOTT is the only direct discharge plant that has it. Also, second-to-last bullet says that funding has been generous in the past, but I do not think there is or has been a sizable state revolving fund program available for some time and gives the false impression that money was lush.

• Page 25, top paragraph: Is DNR really driving the use of advanced wastewater treatment? This doesn't seem correct.

• It does not appear that Ecology was part of the development of this document, and several of our programs are not mentioned at all but really add to the overall understanding. For example, the BEACH program is missing from the overall "what do we know" section, as is the DOH shellfish water quality monitoring program. Much information from the South Sound study will fill in gaps noted in the draft; I'll bring these to the forum. Our understanding of wastewater treatment plant nutrient levels, both nitrogen and phosphorus, is entirely glossed over, and the document drills into stormwater instead. Big picture message is that we ought to work hard to be part of the development of these products in the future rather than held at arm's length.

From: Robert Cusimano

Date: 05/05/2008

Comment: Initial Discussion Draft – Water Quality
April 14, 2008 Page 1

Puget Sound Partnership
Introduction to the Topic Forum Discussion Draft

The attached topic forum discussion draft is one of five papers designed to provoke and inspire a long-term, community conversation and critical thinking about the specific problems facing Puget Sound, and the strategies and actions needed to address the threats we face. These papers and your comments will be used to help create the 2020 Action Agenda. Background on the topic forum process and how this information will be used can be found on our website at

www.psp.wa.gov in the Action Agenda Center.

These initial draft papers are the first effort in our region to synthesize and document what we know about the problems, solutions that work, our current approach to solving problems, and what approaches we need to continue, add, or change. This is hard work that has not been done before. It means 1) looking at Puget Sound ecosystem from the crest of the Cascades to the Strait of Juan de Fuca, 2) providing sources to back up our statements and conclusions, and 3) establishing links between science and policy.

The Partnership asked a small group of science and policy experts to prepare these draft discussion papers as a starting place for the discussion. The discussion papers are DRAFT. They do not yet represent an opinion or position of the Partnership. Nor do they entirely represent a consensus opinion or position of the science and policy experts who prepared or commented on the work. The topic is immense and many of you will find gaps in the work that you may be able to fill.

That is why your involvement is crucial. We very much appreciate your interest and expertise in reviewing this initial work. As you read this paper and prepare to participate in one of the five upcoming workshops, participate in an online discussion, or submit specific comments, the Partnership requests that reviewers keep this context in mind.

• The Partnership will be identifying priority actions that are based on science. There is currently a wide range of opinion about the problems and literally hundreds ideas for solutions. Our hope is that if we can agree on the documented threats to Puget Sound in terms of magnitude and impact, we will have a better chance of creating priority and durable solutions.

• The papers mainly focus on the Sound as a whole. We know that there are variations in problems and solutions in different parts of our region. The action area profiles that we are also preparing will highlight local issues.

• The papers are organized to logically step through three initial questions (two are science and one is policy) that build to a rational conclusion (the fourth question) about the strategies and actions that we will need continue, add, or change as a region. The design is intentional so that 1) our policies are based on science and 2) scientists and policy experts talk to one another.

• These initial papers will contribute to a synthesis paper that will describe links between each of the topic areas. Reviewers may want to read more than one paper to begin to see the links across our individual interests and concerns.

The papers reach different types of conclusions for where to focus efforts, and in some cases the suggested solutions are far-reaching. Before we get to a synthesis paper (and workshop), we want the initial papers to be as accurate as we can in the time that we have available.

• The intent of papers is to focus on WHAT the problem is and WHAT solutions are needed, rather than HOW to implement specific solutions. For example, we know that we will need to do more to protect habitat and concentrate growth into urban areas. There are many ways to accomplish this task and different methods will be needed around Puget Sound. We will create the "how" with those who have to implement the solutions.
• The papers intentionally do not focus on the need for more education/outreach, new funding strategies including creative incentives, and a coordinated monitoring and adaptive management program. The Partnership knows that these three aspects are critical to long-term success and is using other processes to address them. That work is linked to the development of the action agenda. By addressing the system-wide needs, we will be able to more effectively focus the education/outreach and funding.
• The Quality of Life "topic", or Partnership goal, is not yet represented in these papers, but will be part of our subsequent work to synthesize across the topics.

You may comment on the draft papers by attending in the topic forum workshop, participating in the online discussion at www.psp.wa.gov, or submitting a comment via email or in writing. When reviewing the papers, please consider the following questions:

• Current knowledge: Have we accurately described what we know and don't know about the status of and threats to this topic in the Puget Sound region and the certainty of our knowledge? Have we missed any major documented findings?
• Effectiveness of tools: Have we accurately characterized what is certain and uncertain about the effectiveness of the tools available to address threats to this topic? Have we missed any major documented findings?
• Current strategies: From a topic perspective, have we accurately characterized what we are now doing to address threats? Have we missed any major programs or projects?
• Strategies to continue, add, or change: Given the status of and threats to the topic, effectiveness of the tools available, and current strategies to address threats, have we accurately captured the strategies we should continue, add or change? Have we missed any strategies and actions we should continue, add or change to address the threats (not just good ideas)? What sources have informed your thinking?

• Establishing criteria: Are the proposed criteria for prioritizing topic-specific actions appropriate and sufficient? Are there other criteria to consider?
• Measuring progress: Have we identified appropriate measures to assess progress toward goals for this topic? Have we missed any key measures of progress?

This initial discussion draft paper includes several areas where the authors have noted that their preliminary information synthesis and findings are in need of additional information. Topic Forum participants with relevant information are requested to bring this information into the discussion, either by attending the Topic Forum or by providing the publication or relevant citation to the Topic Forum team.

Science Question 1 (S1): Status of Water Quality in Puget Sound

The waters of Puget Sound and its basins range from relatively pristine to degraded. Water quality is affected by pollutants, including toxic compounds, nutrients, and pathogens, and sediment quality is affected by persistent organics, inorganics, and carcinogens from past human activities. Pollutants enter the Puget Sound ecosystem via stormwater runoff, industrial discharge, wastewater discharge, groundwater, septic leakage, deposition of airborne particulates, and marine discharge and spills. Much of this mix washes down from the rivers and streams to the marine waters, and deposits contaminants in the sediments within the Puget Sound basin.

Regulatory entities such as the Washington State Department of Ecology (Ecology) measure many of the substances deposited in Puget Sound waters, but tracing these pollutants to their sources or determining their risk to humans and other species is resource intensive. Additionally, the measurement of some pollutants is difficult, since they cannot be detected until they have accumulated in tissue samples of shellfish, fish, marine mammals, and other species.

The available scientific evidence, combined with the regulatory assessments conducted by Ecology under their Clean Water Act responsibilities, does not generally support a conclusion that the freshwater streams and lakes of Puget Sound or the marine waters are universally contaminated from pollutants for which there are established standards. However, we lack standards for many toxics and conventional pollutants, and it is unclear that established standards adequately protect aquatic and human health. In addition, many of the organic compounds of concern are of very low solubility in water, and would not be detected in water samples even though they are seen in sediments and in the flesh of fish and high levels of the food chain.

Serious impairment to water quality and sediment does occur in localized sites in Puget Sound under existing standards and sampling methods. Over 1,000 freshwater bodies around Puget Sound are listed as Category 5 impaired water bodies on the Clean Water Act Section 303(d) list, and over 30,000 acres of shellfish beds are closed to harvest. Low dissolved oxygen events are observed in the marine waters of the South Sound (Roberts et al., 2008), Hood Canal (Newton et al., 2007a), as well as shallow enclosed bays (**cite 303(d) list) and appear to be increasing in frequency and duration. Contamination of marine sediments varies widely throughout the Sound, with high levels of toxics such as polychlorinated biphenyls (PCBs) present in areas such as Elliott Bay. Although "legacy toxics" such as PCBs and DDT are decreasing in some areas, other toxic contaminants such as polynuclear aromatic hydrocarbons (PAHs) appear to be increasing.

Waters of the Sound basin (both fresh and marine) may also be affected by climate change in the future. Climate change scenarios project increasing marine water temperatures and changes to marine water circulation patterns. Some regional and local studies have found a change in seasonal river discharges (Vaccaro, 2002; Dettinger, 2005) that may be due to climate change. Coupled with increasing population, water quality protection and restoration will continue to be severely challenging in Puget Sound.

A. Documented threats to fresh water and marine water quality in Puget Sound

Five general categories of pollutants affect water quality and sediment quality in Puget Sound:

• Nutrients are natural and synthetic substances that stimulate plant growth. Although nutrients occur naturally, excessive loading of nutrients can have significant effects on the condition of marine and freshwater systems, stimulating algal blooms, depressing oxygen levels, and leading to losses of aquatic vegetation and fish kills. Of particular concern for Puget Sound are phosphorus levels in fresh water and nitrogen in marine waters.

• Pathogens are disease-causing microorganisms that include a variety of protozoa, bacteria, and viruses. Some pathogens occur naturally in the marine environment, but most are associated with human and animal wastes and can contaminate shellfish beds, water supplies, and recreational waters and beaches.

• Toxics refer to the array of chemicals that have been released into Puget Sound that can be toxic to humans, animals, and plants depending on the

concentration and the length of exposure. Many toxic chemicals create additional risks because they are persistent (resist breaking down) and are bioaccumulative (increase within organisms) over time.

• Temperature becomes a pollutant, especially in freshwater systems, when shade is removed from riparian areas, water volumes are decreased, water depths are decreased, or when heated effluents from wastewater or stormwater are discharged. The additional heat can stress or kill aquatic organisms, cause disease organisms to increase, or increase the rate of unwanted chemical reactions.

• Suspended sediments or turbidity come from natural and human-caused sources. Accelerated erosion discharges excessive amounts of sediments into waterways. Excessive sediments decrease stream channel depths and fill lakes and estuarine areas faster than normal. Sediments are a major transport mechanism for toxic pollutants and nutrients. They also interfere with behavior and feeding of aquatic organisms, and they can smother organisms or kill them directly by clogging gills.

The fjord-like structure and underwater sills of Puget Sound restrict the circulation of marine water in several locations, and reduce the flushing exchange with the ocean water entering from the Pacific (Albertson et al., 2002; Albertson et al., 2007). Circulation patterns and locally high residence time puts Puget Sound at greater risk from all three categories of pollutants than other estuaries in North America (Puget Sound Action Team, 2007).

Water Quality in Puget Sound Freshwater Systems
Threats to freshwater resources are increasing as a result of urban development. Urbanization typically expands areas of impervious surfaces and reduces forested cover. These changes result in greater volumes and flow rates of stormwater entering freshwater ecosystems, degrading habitats and reducing species diversity (Booth and Reinelt, 1993, Booth et al., 2002, May et al., 1997, Center for Watershed Protection, 2003). Additional, but unquantified, threats from increasing amounts of chemicals entering aquatic ecosystems from these same landscape changes are also likely increasing. Monitoring networks are operated by state, county, and city agencies. No sound-wide compilation of freshwater quality trends has been published, although there is evidence of increasing concentrations of nutrients (Roberts and Pelletier, 2007) and bacteria (____) in some locations but not everywhere (Sargent et al., 2006). Other efforts have identified relative contributions of various river basins to Puget Sound nutrient and bacteria loads (Embrey and Inkpen, 1998; Roberts and Pelletier, 2001; Albertson et al., 2002). There have been an increasing number of impaired water body listings on the State's 303(d) lists

for temperature, fecal coliform bacteria, and dissolved oxygen in freshwater streams over the last 10 years. Key findings include:

• Impaired lakes, rivers and streams: Although lakes, streams, and rivers in the Puget Sound basin met most federal and state water quality guidelines (Ebbert et al., 2000), a variety of impairments have been documented representing concerns for both humans and fish. [Ecology's 2004 listing of impaired surface waters in the Puget Sound drainages (Water Resource Inventory Areas [WRIAs] 1-19) included
1,135 Category 5 water quality listings (primarily for temperature, dissolved oxygen, and fecal
coliforms) and 48 listings for sediments.] The 2008 Water Quality Assessment for freshwater in all Puget Sound Action Areas includes 1388 Category 5 (impaired) water quality listings, 1059 Category 2 (of concern) listings, and 738 Category 1 (meeting standards) listings. Documented impairments from the Washington State Water
Quality Assessment: Year 2002 Section 305(b) Report (Ecology, 2002) included (as a percent of Puget lowlands freshwater stream miles): metals: 50% ± 24%1; fecal coliform: 57% ± 8%; dissolved oxygen:
16% ± 6%; ammonia-nitrogen: 1% ± 2%; pH: 1% ± 2%; temperature: 16% ± 6%. As an example of one area of Puget Sound, of the 563 assessed water bodies (stream, river segments, and lakes) included in the 2004 303(d) database for the Green/Duwamish (WRIA 9), 151 (27%) were identified as being impaired (Category 5). The proposed 2008 Water Quality Assessment has numbers available by Action Area for freshwater – Category 5 & Category 2 would be appropriate statistics to use for an example: As an example of one area of Puget Sound, of the 1202 assessed water quality parameters for stream, river segments, and lakes included in the 2008 Water Quality Assessment for the South Central Puget Sound Action Area, 417 (35%) were identified as being impaired (Category 5), and 295 (25%) were considered waters of concern (Category 2). Dissolved oxygen and pH impairments in these freshwater systems are usually related to an overabundance of nutrients.
1 There may be some dispute over the actual level of metals impairment following findings by Johnson and Golding in 2002 that water-column contamination had occurred in the sampling process (Johnson and Golding, 2002).

Additional discussion of this issue on a Sound-wide basis will be included in the Status and Threats Analysis being conducted by NOAA.

• Mixed Findings on Sediment Contamination in Fresh Water: The 2008 Water Quality Assessment has 13 sediment listings for the Puget Sound Action Areas. Three each are in Category 5 and 1, and seven are in Category 2.

Freshwater sediments show variable conditions throughout the region. The majority of sediment concentrations measured in 27 freshwater streams in King County did not exceed freshwater sediment guidelines (King County, 2005). Historic sediment patterns measured in urban lakes such as Lake Ballinger show decreasing trends for DDT and PCBs, but an increasing trend for PAHs (Van Metre and Mahler, 2005). Several freshwater areas in Puget Sound lakes and rivers are recorded as contaminated and require cleanup under CERCLA regulations (U.S. EPA, 2008, Long et al., 2005).

• Lake Fish Consumption Advisories: The 2008 Water Quality Assessment includes a total of 739 tissue contaminant listings in all Puget Sound Action Areas. Of those, 644 are Category 1 (meets criteria), 70 are Category 5 (impaired), and 25 are Category 2 .(of concern). The Washington State Department of Health (DOH) has completed an assessment of contaminants in numerous lakes in the Puget Sound basin, and issued health advisories for the amounts of fish that are safe to consume per month. The main contaminants of concern are PCBs and mercury which, once released into the environment, move up through the food chain into fish, marine mammals, and humans. Mercury and PCBs have been shown to cause behavioral and learning deficits in children exposed in the womb, so meal limits of certain fish are especially important for women of childbearing age and young children (National Research Council, 2000, Environmental Protection Agency, 2001, Food and Drug Administration, 2001).

• Emerging Contaminants (Endocrine Disruptors, Pharmaceuticals and Personal Care Products):
In a 2007 King County study, four endocrine disrupting chemicals (EDCs) including Bisphenol-A (a plasticizer), total 4-nonylphenol (a surfactant breakdown product), 17-ß estradiol (a natural hormone), and 17-a ethylnylestradiol (a synthetic human hormone) were detected frequently, and seven other
EDCs detected less frequently in a survey of major lakes, rivers, and small streams in King County.
Other pharmaceuticals and personal care products have not been extensively sampled in Puget Sound fresh waters. Screening by Ecology has shown that some fish in the Lake Washington and Snohomish River basins have PBDE (polybrolminated diphenylether) flame retardants in the range of 10 – 200 ug/Kg range (Johnson, etal, 2006).

• Groundwater: Shallow groundwater in urban residential areas has been reported to contain chemicals related to transportation and household activities. In addition, shallow groundwater in these areas can contain elevated levels of nitrate from use of fertilizers on lawns, gardens, and septic system

drainage (Ebbert et al., 2000). Shallow aquifers used for domestic supply in agricultural areas were commonly reported to have nitrate exceedances of the drinking water quality standard. For example, cropland applications in the Nooksack River basin caused nitrate exceedances above the drinking water quality standard in about 60% of groundwater sampled and in subsurface water delivered by tile drains (Ebbert et al., 2000). Historically, surface water has been the main drinking water source for the region. However, as urban development continues, reliance on groundwater as a drinking water source has increased.

• Stream and river discharge: Although no trends have been established in annual mean river discharge to Puget Sound, some U.S. Geological Survey stations have exhibited changes in seasonal flows over time. For example, summer baseflow in the Deschutes River, as estimated by the 7-day average low flow that occurs once in ten years, has declined 30% comparing historical data from 1945-1964 with more recent data from 1991-2001 (Roberts and Pelletier, 2007). Both climate cycles and drinking water consumption likely contribute, although the two may not distinguished. Other rivers within the Puget Lowland may reflect the same pattern.

• Forest cover: Forest cover has declined throughout the Puget Lowland and composition has shifted as a result of anthropogenic activities. Tree cover in Seattle has decreased from 40% in 1972 to 18% in 2006 (City of Seattle, 2006). Conifers dominated pre-European conditions reconstructed from 1873 General Land Office Survey notes but deciduous species dominate today (Collins and Montgomery, 2002). Sediment cores also indicate a shift from conifer to deciduous dominance around 1900 in Seattle (Davis, 1973). The shift from conifer to deciduous dominance is associated with higher loads of nutrients delivered to the streams from surrounding vegetation (Roberts and Bilby, 2008), and there is evidence that higher instream nutrient concentrations result (Volk, 2004; Osbourne, 2006).

Water Quality in Marine Waters and Nearshore Areas

• 303(d) Listings: Most impairments of existing water quality standards for marine waters in the main
Puget Sound basin are for fecal coliform bacteria and low dissolved oxygen. There are additional listings and advisories including organic compounds such as PCBs in fish tissue. Of 704 listings for pathogens in 2004, 79 were for marine sites. For dissolved oxygen, 56 of the 237 listings for dissolved oxygen were for marine areas, and 96 of the 144 total listings for toxics were for marine areas. (Puget Sound Action Team, 2007). (The proposed 2008 Water Quality Assessment has numbers available by Action Area for marine water–

Category 5 & Category 2 would be appropriate statistics to use.)

• Pathogens: As of 2005, over 30,000 acres of commercial shellfish beds remained closed to harvesting due to water pollution, including fecal contamination (Newton et al., 2007). Sources include failing septic systems and other nonpoint sources (including stormwater and in some cases, agriculture) (Newton et al., 2007). Fecal coliform bacteria levels above state standards are typically used as an indicator of contamination. Bacteria monitoring within recreational beaches (Washington State Department of Ecology, 2008b; Washington State Department of Health, 2008; Thurston County Environmental Health, 2008) indicates good water quality in some areas but provides the basis for closures and cautions in others.

• Hypoxia: South Puget Sound has historically shown signs of periodic low oxygen and susceptibility to nutrient enrichment (Albertson et al., 2002) and ongoing efforts combine data collection and three-dimensional modeling to understand the contributors (Albertson et al., 2007). Although low concentrations of dissolved oxygen in Hood Canal have been observed during late summer and early fall as far back as the 1950s, available data suggest that concentrations of dissolved oxygen vary from year to year but have been trending lower over time, with longer durations of low concentrations (USGS, 2008); however, low dissolved oxygen levels occurred prior to European settlement (Crecelius et al., 2007).

• Nutrients: Embayments in Puget Sound tend to show higher sensitivity for hypoxia and other problems related to excess nutrients due in part to limited circulation. Inorganic nutrients contribute to algal blooms which in turn contribute to oxygen depletion in the Sound. Fish, shellfish, and eelgrass mortality has been linked to hypoxia related to these blooms. Surface primary production in the open waters of the Puget Sound main basin is nutrient-limited at times during June and October, and therefore sensitive to the addition of nutrients (Newton and Van Voorhis, 2002). Watershed contributions vary spatially, and watershed hot spots have been identified (Embrey and Inkpen, 1998; Roberts and Pelleiter, 2001; Albertson et al., 2002). The ongoing cycles of increased blooms can also lead to accelerated eutrophication of embayments and other areas of the Sound (Newton et al., 2007). This is a result of the combination of the oceanographic conditions resulting from the shape of these bays and the proximity and importance of terrestrial nutrient and sediment sources transported by stormwater and streams. The low flushing inherent to these shallow and enclosed embayments, the shallow waters that bring much of the bottom into the lighted or euphotic zone, and the relatively high proportion of the bay volume contributed by enriched fresh water increase the prevalence of low oxygen and nuisance

blooms of microalgal and macroalgal species.

• Metals: Widespread impairment from metals is uncertain. In 2000, Michelson found that measured metals were significantly below the relevant marine water quality criteria in samples collected at 5 and 50 meters below the surface in several cross transects of the middle Puget Sound basin (Michelson, 2000).

• Endocrine Disrupting Chemicals: A survey of marine waters in King County (King County, 2007) obtained results similar to those for freshwater lakes, rivers, and streams.

Sediment Quality

Sediment-water interactions are a critical component to understanding overall water quality in Puget Sound. Sediments represent an important reservoir for bacteria (Ahmed, 2008) and nutrients (Aura Nova Consultants et al., 1998; Roberts et al., 2008) that must be considered, particularly for shallow water areas. Sediments also represent an important ecological niche.

The 2008 Water Quality Assessment includes 4650 sediment contaminant listings for the marine areas of Puget Sound. Of these, 2566 are Category 1 (meet criteria), and 403 are Category 5 while 749 are Category 2. The rest were once contaminated but are now under remediation plans. The available scientific evidence, combined with the regulatory assessments conducted by Ecology under their Clean Water Act responsibilities, generally supports a conclusion that marine sediments in localized areas of Puget Sound are contaminated. However, there is greater variability in the data for freshwater sediments, making it difficult to conclude the status. A large-scale survey undertaken by NOAA and Ecology in 2005 showed widespread contamination but at levels less than regulatory criteria (Long et al., 2005). Key findings include:

• PCB Contamination: Marine sediment PCB contamination varies among Puget Sound basins, with the Seattle area showing the highest concentrations (O'Neill, 2004).
• Biota: Other Topic Forums are covering biota and potential effects from contamination, therefore they are not included here.

[Authors/Reviewers request more information on the contribution of existing contaminated sites to the overall loading.]

B. Sources and pathways for nutrients, pathogens, and toxics entering Puget Sound water bodies

Stormwater Runoff

A large part of the toxic chemicals that enter Puget Sound marine waters is carried through runoff from the land surface. Developed lands contributed the majority of several toxic chemicals to Puget Sound (i.e., cadmium, lead, zinc, nonylphenol, and oil and petroleum products). Studies have suggested that runoff from the land surface and deposition from the air (directly to marine waters) have imposed considerable loads of contaminants to Puget Sound (Hart Crowser et al., 2007). Roads, farms, highways, parking lots, residential homes, lawns, timber harvest areas, and golf courses all leave a chemical signature on the landscape. These chemicals are mobilized by rainfall and transported via stormwater runoff to receiving waters and sediments in the marine environment (Ruckelshaus and McClure, 2007).

Stormwater impacts on stream hydrology and habitat have been documented for decades, and it is well established that stormwater is a significant transport mechanism for pollutants to receiving streams and marine waters. These pollutants are both dissolved into water and attached to sediments and other particles mobilized by stormwater and transported to freshwater and marine aquatic habitats (Gobel et al., 2007). Stormwater from urbanized watersheds exhibits higher average concentrations, fluctuations, and loadings of pollutants than undeveloped open space areas (Stein et al., 2007). Increasing extent of impervious surface is associated with decreases in aquatic habitat quality (Booth and Reinelt, 1993, Booth et al., 2002, May et al., 1997, Center for Watershed Protection, 2003).

At the same time, tracking individual pollutant sources to specific land uses has been problematic, based on the high levels of variability observed from differing land use classes (Pitt et al., 2005a, Pitt et al., 2005b). Source identification has been used in some Puget Sound watersheds to identify land use-based causes of fecal coliform loading (Sargent, 1999).

Storm-driven fecal coliform bacteria loads have been responsible for more restrictive clean-up targets in several Puget Sound watersheds including the Nooksack (Hood and Joy, 2000), Stillaguamish (Lawrence and Joy, 2005), Union River (Sweet, Ward, Butkus, and Ehinger, 2002), Skokomish (Barrecca, 2001; Seiders, Hoyle-Dodson, Pickett, 2001), Dungeness (Sargeant, 2002), Nisqually (Sargeant, Roberts, and Carey, 2005), and lower Sound tributaries (Ahmed and Hempleman, 2006) among others. The Department of Health also uses storm intensities to regulate 16 Conditionally Approved commercial shellfish beds in Puget Sound (DOH, 2007).

Range and Variability of Pollutants

Pollutants found in stormwater include:

• Metals (cite ENVVEST/Sinclair/Dyes Inlet; Woodward and Clyde Consultants, 1994, UNECE, 2003, Stein et al., 2007) from many sources, including transportation-related byproducts such as metals from brake linings (Westerlund, 2001, Woodward Clyde Consultants, 1994, UNECE, 2003, and Brewer, 1997); Industrial stormwater zinc and copper investigations from Golding, 2006.

• Airborne pollutants from more indefinable sources such as remote industrial, heat, and power generating plants (Brinkman, 2004);

• Polynuclear aromatic hydrocarbons (PAHs) (Van Metre et al., 2000, Stein et al., 2007) from asphalt surfaces and paving resealants (Kriech, 2002, Mahler et al., 2005) and incomplete combustion of petroleum products from vehicles, homes, and other sources;

• Organophosphate pesticides (Schiff and Sutula, 2004) from landscaping byproducts;

• Nutrients (cite ENVVEST/Sinclair/Dyes Inlet; Pitt et al., 2005a, Pitt et al., 2005b);

• Total suspended solids (Stein et al., 2007, Barco et al., 2008), and

• Pesticides and Other pollutants related to residential, industrial, agricultural, recreational, or other activities (Minton, 2005). Thornton Creek studies (Bortleson and Davis, 199) Pesticides in selected small streams in the Puget Sound Basin.

The concentrations of pollutants are highly variable from storm to storm event, and by land use (Pitt et al., 2005a, Pitt et al., 2005b, Washbusch et al., 1999, Barr Engineering Company, 2005, Woodward Clyde Consultants, 1994, Westerlund, 2001, Van Metre et al., 2000, Schiff and Sutula, 2004, Stein et al., 2007, UNECE, 2003, Brewer, 1997, Brinkman, 2004, Kayhanian et al., 2002). Different classes of pollutants wash off surfaces at different times during a storm (Egodawatta et al., 2007, Gobel et al., 2007, Kayhanian et al., 2002, Legret and Pagotto, 1999). Specific adverse effects associated with the different pollutants washing off and being transported in stormwater cannot easily be identified based on the differences in their environmental fates (degradation and compartmentalization) and differences in exposure concentrations as these compounds move through the environment.

Hydrology, Connectivity, and Imperviousness

Research in Puget Sound streams clearly demonstrated the negative effects of increasing extents of impervious surface (e.g., roads, rooftops, parking lots) on aquatic habitat quality (Booth and Jackson, 1997, Booth et al. 2002, May et al., 1997, Center for Watershed Protection, 2003).
Research in Wisconsin in streams with similar characteristics to Puget Sound also demonstrated a strong correlation between impervious connectivity (for example, defined pathways for stormwater to flow via ditches or pipes to an outfall) and habitat quality. The number of fish species, index of biotic integrity (IBI, a measure of the presence and type of macroinvertebrate communities), and base flow were invariably low (Wang et al., 2001) at connected imperviousness levels greater than 12% of a basin. Puget Sound drainages range from 2% urbanized in the Hood Canal basin to 23% urbanized in the main basin (Ruckelshaus and McClure, 2007). Although aquatic habitat quality has been shown to be impaired at lower levels of imperviousness, water quality impairment from pollutants has been measured at higher levels of imperviousness (greater than 40%) (Brabec et al., 2002) in three studies reviewed. Hydrologic variability in wetlands resulting from urbanization and increased stormwater runoff has also been shown to impact wetland quality more than increased concentrations of pollutants (Azous and Horner, 2000). Much of the urbanization has occurred along valley floors where river channels have been forced to follow a diked, ditched, or piped corridor. Older stream channels and hyporheic areas may still carry contaminants from the urbanized or agricultural landscape to these surface waters (Lawrence and Joy, 2005).

Urbanization

Between 1991 and 1999, an additional 1% of the total area in the central Puget Sound region was newly developed and, during the same period, the designated forest land decreased to a total of 55%. In the Puget Sound region, most development has occurred within Urban Growth Boundaries (designated under the State Growth Management Act) and forest cover within those boundaries has decreased by 11.1%. Almost half of the conversion to urban uses has occurred in the Seattle metro area (Alberti in Sound Science, 2007).

Effects of Stormwater Pollutants on Species

Determining the actual effects of stormwater pollutants directly on aquatic organisms in freshwater ecosystems has been difficult. We know that at greater than 10% imperviousness and less than 65% forested land cover, reductions in

stream quality, as measured by species diversity, occur (Booth and Jackson, 1997, Booth et al., 2002). However, it is difficult to state with certainty that species diversity will be universally high at less than 10% imperviousness and greater than 65% forested land cover. Receiving water conditions (ions and dissolved organic carbon) strongly influence the toxicity of metals (Santore et al., 2001, Paquin et al., 2005). It is very difficult to create the types of naturally occurring exposures and their episodic nature in laboratory environments (Zhao and Newman, 2006) to evaluate effects. It has also been documented that organisms can potentially recover from short duration exposures to toxicants if they are given a sufficient recovery time before a subsequent exposure (Zhao and Newman, 2006).

Studies on the impacts of stormwater on salmonids have indicated that metals concentrations below those commonly observed in stormwater can adversely affect the salmon's sense of smell (Sandahl et al., 2004). Coho prespawn mortality rates in Longfellow Creek demonstrate the concern for stormwater effects on salmon (McCarthy et al., 2008). No causative agent was identified for pre-spawning mortality of Chinook salmon in King County streams (Berge et al., 2006). What is lacking are standards that capture these ideas of frequency (how often effects occur), magnitude (how much of the toxic substance is present at any one time), and duration (how long the exposure lasts each time a compound is present).

Runoff from Agriculture, Forest Practices, and Landscaping

Puget Sound has plentiful rain, fertile soils, and excellent growing conditions for agriculture and forest practices. Also, many residents in the area participate in small-scale farming activities, and urban and suburban residents landscape their yards. Agricultural, forestry, and landscaping activities can all be sources of pollutants that are transported to Puget Sound water bodies.

• Nutrients: In a 1998 USGS study, animal manures, agricultural fertilizers, and atmospheric deposition were among the top three identified sources of nutrients (inorganic nitrogen and phosphorus) to the rivers and streams of the Puget Sound Basin (Inkpen and Embrey, 1998).

• Pesticides: Pesticides were detected at elevated concentrations in King County streams during wet weather events (King County, 2002).

• Pathogens: Animal waste is a significant source of fecal coliforms as well as Cryptosporidium and Giardia (Hutchinson et al., 2005, Bradford and Schijven, 2002) which can be transported through stormwater overland flow to streams (Miller et al., 2007, Lewis et al., 2005). This is a frequent concern with

livestock operations such as dairies, but pathogenic pollution can also occur as a result of land application of animal manure as fertilizer (Mishra et al., 2008, Soupir et al., 2006, Reilly, 2001). Domestic pet wastes are significant sources of bacteria in stormwater from urban areas. Microbial source tests also frequently identify adaptive animals like raccoons, opossums, and rodents as significant sources of bacteria from urban environments.

• Emerging Contaminants: Animal waste has also been pinpointed in recent years as being a source of both natural and synthetic hormones that can act as endocrine disruptors (Lucasa and Jones, 2006, Hanselman et al., 2003). As with pathogens, these contaminants can be conveyed through overland flow to fresh and marine water bodies or as a consequence of purposeful land application.

[Authors request material about the linkage between agricultural and forestry practices and fecal coliform bacteria.]

Algal Dynamics
Phytoplankton and zooplankton profoundly influence water quality in Puget Sound. However, phytoplankton have been characterized only for portions of Puget Sound (Eisner et al., 1994; Aura Nova Consultants et al., 1998; Roberts et al., 2007), and phytoplankton speciation is not part of the ambient monitoring program within Puget Sound. Zooplankton are not well characterized in Puget Sound.

There is an increasing concern over the spread and impacts of toxins generated by harmful algal blooms (HAB) (Jewett et al., 2007), a small subset of marine and freshwater algae with strong public health significance. With an increase in the population near coastal areas and lake shores, along with the apparent spread of harmful algal blooms, it is reasonable to expect an increase in the incidence of poisoning by natural phytoplankton-related toxins. These toxins can cause both short- and long-term health impacts, including death, to humans, pets, marine mammals, and other organisms, including fish species, both wild and farmed (Ruckelshaus and McClure, 2007, Trainer et al., 2007). A network of monitoring sites and research on rapid detection systems are developing. The relationship between anthropogenic contributions such as nutrient loading and outbreaks of HABs requires additional research.

Wastewater and Septic Systems
Many municipal wastewater treatment plants discharge treated wastewater directly into Puget Sound or to its tributary rivers and creeks . Additionally, combined sewer overflow outfalls sometimes discharge mixed stormwater and untreated wastewater to these waters during wet weather when conveyance or

plant capacities are exceeded. Combined sewer overflows occur in limited areas, especially in older metropolitan areas. .Wastewater is a source of a broad spectrum of pollutants, nutrients, and pathogens (King County, 1991).

[Authors and reviewers note the need for more information regarding the relative importance of wastewater and septic for marine and fresh waters.]

The relative contributions of wastewater treatment plants discharging directly to Puget Sound has been evaluated for South and Central Puget Sound. Wastewater treatment plant s contribute 51% and rivers discharge 49% of the annual dissolved inorganic nitrogen load to South Puget Sound, although the proportion increases to 78% from wastewater treatment plants in late summer (Roberts et al., 2008). Combining nutrient loads to South, South Central, and North Central Puget Sound, directly discharging wastewater treatment plants contribute 79% of the annual load of dissolved inorganic nitrogen but >90% of the late-summer load. In an earlier study based on data collected during a wetter period, rivers contributed 67% of the annual dissolved inorganic nitrogen load south of Alki Point, while wastewater treatment plants contributed 33% (Albertson et al., 2002).

• Geographic effects of wastewater: Wastewater nutrient contributions to marine areas in Hood Canal (Newton et al., 2007b) and South Sound (Roberts et al., 2008) and potentially contribute to low dissolved oxygen in these and other shallow embayments throughout Puget Sound (Newton et al., 2007a).

• Wastewater pollutants: Treated municipal sewage contains a complex mixture of personal care products (e.g., shampoo), caffeine, endocrine-modulating chemicals (e.g., birth control pills), antidepressants, and other pharmaceuticals (USGS, 2002, 2008). Many studies have correlated the presence of estrogenic compounds to impaired reproduction in fish, amphibians, and other animals which has raised significant concern in the scientific community about the impacts of these chemicals (Ketata et al., 2008, Stoker et al., 2008, Anway and Skinner, 2006, Anway et al., 2005). A more recent study focused on the bioaccumulation of these compounds in worms, which had impacts on the worms' predators higher in the food chain (Markman et al., 2008). Other studies are starting to document the presence and transfer of these chemicals in human placenta (Tsutsumi, 2005) and what this might imply for human fetal development and reproduction (Takeuchi et al., 2004, Ikezuki et al., 2002, Pauwels et al., 2001). Wastewater also contributes concentrated levels of dissolved inorganic nitrogen, although the concentrations are much lower with advanced wastewater treatment that includes denitrification (Roberts et al., 2008). Fecal coliform bacteria concentrations in treated wastewater are low and controlled by disinfection

practices.

• Pathogens: Pathogens are indicated in water quality measurements by the use of indicator organisms, common bacteria from the guts of warm-blooded organisms, that while mostly harmless to humans, indicate by their presence the possible risk of fecal contamination. The use of these indicators to manage both shellfish harvest and swimming contact has been largely successful in minimizing water-borne disease transmission. In Puget Sound basins, the principal sources of these indicators are older septic systems that were sited near water bodies, poorly maintained septic systems, some types of livestock practices, cross connections between sanitary and stormwater systems, pet waste, wild animals (including marine mammals), and vessels. Although it is presumed in some locations that the presence of pathogens in water bodies is due to failing septic systems, this is not always the case and extensive testing is needed to identify sources. One additional pathogen issue apart from those associated with specifically fecal contamination has been the presence of naturally occurring pathogens such as Vibrio sp., which have been implicated in disease outbreaks (Fuenzalida et al., 2007, Su and Liu, 2007, Fuenzalida et al., 2006, Gonzalez-Escalona et al., 2005, DePaola et al., 2000). The sources, extent, and control of pathogens are discussed in the Human Health Topic Forum.

• Wastewater discharges: Loadings of toxics that were attributable to permitted point-source discharges, specifically industrial and municipal wastewater plants, incompletely accounted for total loadings being detected (Hart Crowser et al., 2007). Other potential sources such as stormwater runoff must therefore be contributing to the total load of toxic substances.

• Combined sewer overflows: Episodic discharge of a mixture of untreated wastewaters and stormwater from combined sewer overflow outfalls contributed relatively little to the total loading of toxic chemicals to Puget Sound (Hart Crowser et al., 2007) and are believed to be small in comparison with other sources of nutrients and bacteria? (Roberts et al., 2008). A few communities in the Puget Sound region include areas still served by combined sewer systems.

• Septic systems: There are approximately 472,000 septic systems in the Puget Sound basin, according to previous estimates by the Puget Sound Action Team. Septic systems are not generally designed for nitrogen removal, and leachate contains high levels of nutrients. If systems are not designed well, which may mean poorly draining soils or excessive hydraulic loading, leachate is not properly treated in the soil column. Work conducted in Hood Canal indicates that … When systems are located near streams and marine waters,

the leachate may be a significant source of nitrogen, and if they are improperly designed or maintained, they are a major source of pathogens. [Authors and reviewers note more specific description with data on geographic concentrations and magnitude is needed.]

• Wastewater discharges to streams: Some streams and rivers tributary to Puget Sound receive treated wastewater effluent discharges. Some instream transformation may occur such that flow through the rivers attenuates the nutrient loads from the point of discharge. However, pH and dissolved oxygen criteria are sometimes compromised in downstream waters where benthic algae communities become overabundant, especially from the additional phosphorus, ammonia, and biochemical oxygen demanding substances in the wastewater (Cusimano, 1995; Lawrence and Joy, 2005). Generally, bioassessment measurements of stream health have not been directly correlated with wastewater treatment plant discharges (Dyer and Wang, 2002, Diamond and Daley, 2000). Endocrine disruptors, generally associated with wastewater discharges (USGS, 2008), have been observed both upstream and downstream of freshwater outfalls in King County, implying additional sources of these substances, such as on-site wastewater system discharges, wastewater cross connections, or agricultural wastes (King County, 2007).

• Effects on lakes: Many lakes are also in decline (Rector and Hallock, 1994) and evidencing signs of accelerated aging (eutrophication). Nonpoint sources and failed or poorly sited septic systems are suspected as the primary inputs of nutrients. In larger basins, like the Lake Washington watershed, nonpoint sources from urban and forestry land uses are generally more significant sources of nutrients than contributions of lakeside resident activities (Ecology, 1997). Lake Washington itself has been the focus of significant cleanup efforts (Edmondson, 1991), and has recovered from the eutrophic, over-enriched state that existed in the 1950s to 1960s (Tetra Tech and Parametrix, 2003). The key to rapid recovery was the lake's depth, which contained large stores of dissolved oxygen; and the reduction in phosphorus loading that occurred with sewage diversion. The lake is sensitive to phosphorus loading, and the maintenance of present-day water quality is dependent on keeping phosphorus loading at or below current levels. Minimal development of the Cedar River basin has been a key factor in recovery and maintenance of lake water quality.

Industrial and Commercial Practices

The effects of industrial discharges, which are normally classified as point sources, are generally localized. Industrial pollutants have been reduced over the last few decades with the advent of source substitution, improved waste management practices, and greater regulatory oversight. Still, past practices continue to have an effect on freshwater and marine resources in Puget Sound,

primarily through the remobilization of contaminated sediments that were impacted years ago. There are a few geographic regions in Puget Sound where industrial practices are still the dominant land use; these include the Lower Duwamish Waterway in Elliott Bay, Commencement Bay in Tacoma, and Sinclair Inlet in Bremerton.

Contaminated Sediments
Stormwater provides a primary transport mechanism for pollutants from industrial, transportation, and commercial activities. Concentrations of metals (copper, lead, mercury, and zinc), PAHs, polychlorinated biphenyls (PCBs), and Bis(2-ethylhexyl) phthalate (BEHP) were detected in on-site industrial catch basin sediment samples near the Lower Duwamish Waterway. Many concentrations were above the sediment cleanup screening level (CSL) (King County and Seattle Public Utilities, 2005). Different pollutants attach to different sediment particle sizes. For example, metals are typically associated with finer grained sediments, while PAHs are associated with fine to coarse sediments (Robertson and Taylor, 2007). Several freshwater areas in Puget Sound lakes and rivers are recorded as contaminated and require cleanup under CERCLA regulations (U.S. EPA, 2008)

Contaminated sediments are also an avenue of toxic exposure for marine aquatic organisms. Some toxics are known to bioaccumulate in these organisms and are transported through the food web. The toxicity of metals in sediments depends on their bioavailability (DiToro et al., 1990). Marine sediment PCB contamination varies among Puget Sound basins and is localized to urban and industrial deposition areas, with the Seattle area showing the highest concentrations (O'Neill, 2004, Long et al., 2005).

• Effects of sediment contamination: PCB accumulation in benthic and demersal fishes is correlated with sediment concentrations. The highest correlation is for fish with small home range, and accumulations increase with trophic level (biomagnification) (O'Neill, 2004).

• Biomagnification: Researchers found that sediment-associated flatfish from polluted sites had high incidences of liver disease and cancer. As they move through the food web, concentrations of persistent, bioaccumulative chemicals may become much greater, a process known as "biomagnification," and pose an important health risk for top-level feeders such as salmon, raptors, marine mammals, and humans (Ruckelshaus and McClure, 2007).

• Sediment cleanup: Numerous water and lands recorded as contaminated are requiring cleanup under CERCLA regulations (USEPA, 2008a).

Metals
The level of severity of metals contamination in water samples collected in 2006 by Washington State
Department of Ecology at freshwater locations around the state was variable. Only 8 sites out of 639 where dissolved metals and mercury results were reported exceeded 2006 Washington State water quality standards chronic criteria, and none were in the Puget Sound basins (Ecology, 2007d). However, there is an ongoing debate on whether the existing metal standards are protective, particularly for copper. Research by scientists at the Northwest Fisheries Science Center has shown that olfactory response to copper in coho salmon occurs at levels of 2 parts per billion (ppb) over background concentrations (Baldwin et al., 2003). The comparable marine standards are currently 4.8 ppb acute and 3.1 ppb chronic.

Groundwater
[Authors and reviewers note the need for more information regarding the relative importance of groundwater relating to the health of Puget Sound.]
Direct groundwater contributions to Puget Sound vary by location. **Cite Hood Canal groundwater work**. In South Puget Sound, groundwater generally discharges to freshwater bodies and is included in river inputs. Direct groundwater contributions are one to two orders of magnitude smaller than surface water discharges (Drost et al., 1999; Pitz, 1999; Albertson et al., 2002).

Air Deposition
Atmospheric deposition directly to Puget Sound appears to be an important source of loading for some chemicals of concern (Hart Crowser et al., 2007). Deposition of contaminants from air pollution is increasingly being noted as a significant pollutant source. Growing evidence suggests that toxic contaminants are not confined to a few specific “hot spots” associated with industrial uses. Airborne particulates from the fuel emissions of cars, trucks, and stationary sources wash into rivers, streams, and marine waters and upload back into the food web. In 2001, an estimated 7.7 million pounds of toxic chemicals were released into the air in the Puget Sound basin from stationary sources alone (not including mobile sources such as cars or trucks).

Recent efforts to compare the importance of atmospheric deposition among other sources (Hart Crowser et al., 2007) determined that the atmospheric loading represented a fraction of the surface runoff loading. However, that study also indicated that atmospheric deposition of both metals and organics has a greater degree of uncertainty than the surface runoff loading rates based on the limited number of measurements in the Puget Sound area. [Authors requesting more material on this topic.]

Nutrient contributions from air deposition are low in the Puget Sound region compared to other parts of the United States (NADP, 2008), and generally contribute low levels of nutrients compared with other sources (Albertson et al., 2002; Roberts et al., 2008).

Recreational Water Activities
Freshwater lakes and rivers and the marine waters in Puget Sound provide popular recreational opportunities for boaters, anglers, and outdoor enthusiasts. Many of these water bodies have recreation-associated facilities including boat ramps, docks, and dockside fueling facilities. In addition to pollutants from motorized boats (fuel leaks, emissions, waste discharges), docks and fueling facilities can be a source of pollutants to water bodies in Puget Sound. [Authors requesting more material on this topic.]

Treated wastewater discharges from cruise ships and spills or accidental releases from recreational boats are believed to occur, but no specific loads have been developed for nutrients or pathogens. Treated cruise ship discharges are not believed to threaten shellfish areas (Washington State Department of Health, 2007). Jankowiak (2007) reviewed compliance with the Memorandum of Understanding between Department of Ecology, the NorthWest CruiseShip Association, and the Port of Seattle and found that while the majority of vessels were in compliance , several instances of non-compliance did occur. Marinas have also been identified as sources of fecal coliform bacteria (**CITATION**).

Creosote-Treated Timber Piles
High levels of PAHs and dioxins/furans found in creosote are toxic to fish and sediment organisms (Pastorok et al., 1994). The concentrations of metals and PAHs are higher near treated docks (Wendt et al., 1996). However, studies have shown that there are no measurable short-term effects on estuarine organisms on or near dock pilings (Wendt et al., 1996). The long-term risks associated with docks are unknown, although the PAHs and dioxins/furans associated with creosote are very persistent in the environment.

Marine Traffic
There is little documentation about the importance of marine traffic on water quality conditions in Puget Sound, either through direct discharges of ballast water and wastewater or through deposition from exhaust particulates. [Authors requesting more material on this topic.]

Oil Spills
The total amount of reported oil and petroleum products from reported spills directly into the surface waters of the Puget Sound basin was about 4% of the

amount estimated to enter via surface runoff. When the relatively rare large spill occurs, it often has a large local impact, including acute toxicity to organisms and plants. Shellfish and other types of marine commercial and recreational harvest are usually curtailed.

C. Gaps in knowledge

Circulation plays a fundamental role in water quality. Several ongoing efforts have improved understanding of circulation and relationships with water quality (Aura Nova Consultants et al., 1998; Albertson et al., 2002; Albertson et al., 2007; Edwards et al., 2007; **add Kawase references from PSRC** add ENVVEST report reference for Sinclair/Dyes**), although continued investigations are needed using a combination of modeling tools and in situ measures such as acoustic Doppler current profilers to understand the role circulation plays in complex embayments.

Summer river discharge has declined in the Deschutes River (Roberts and Pelletier, 2007). Long-term gaging records for other rivers should be evaluated for influences of climate cycles, water withdrawals, and urbanization on seasonal high and low flows.

Nutrient and bacteria loads to Puget Sound have been established for major rivers (Embrey and Inkpen, 1998), tributaries to Hood Canal (Osbourne, 2006; Frans et al., 2006) South Puget Sound (Roberts and Pelletier, 2001), and Central Puget Sound (Roberts et al., 2008). However, relative contributions of point and nonpoint sources of pollutants should be developed for nutrients and pathogens for the rest of Puget Sound and for other parameters. For regional hot spots, supplemental work should begin investigating pollutant sources upstream within watersheds.

Areas influenced by specific point and nonpoint sources (including septic systems) can be identified using the developing circulation models. As an example of the utility of this approach, hydrodynamic and bacteria modeling in Sinclair and Dyes Inlet indicated that anthropogenic sources were unlikely to affect water quality within a specific shellfish bed, which has since been reopened by the Department of Health (**cite ENVVEST**).

Pollutant fate and transport are important to understand and will combine knowledge developed from loading analyses and modeling tools. In situ studies may be needed to quantify the processes that control pollutant transformation and breakdown in the marine environment.

Long-term trend analysis should be conducted using the extensive and

documented monitoring networks maintained by tribal, federal, state, county, and city agencies for both freshwater and marine water. For example, dissolved oxygen levels in central Budd Inlet have declined over the past 20 years despite the construction of advanced wastewater treatment in 1994 (Roberts and Pelletier, 2007).

Sediment processes influence bacteria and nutrient dynamics in inlets with water quality impairments, but relatively little information is available (Ahmed, 2008; Roberts et al., 2008). Sediments should be investigated as a reservoir of pathogens and nutrients in other areas with water quality impairments.

In addition, while some work has been done on the survival, fate, and transport of different pathogens in waters and sediments, we still cannot accurately predict the breadth of impacts on water quality. This is both a regional and a national research need.

Emerging contaminants and their environmental consequences are also questions for which the scientific community is developing answers. Although most research points to detrimental effects these constituents may have on freshwater and marine ecological communities, there are still significant facets of this topic that require further research. Our understanding of the impacts of marine traffic is also limited, as is our comprehension of the related pollutant contributions due to recreational water use. The contribution of air pollutant loading to waters is also recently being identified as a potentially significant source of contaminants to Puget Sound waters.

The aforementioned gaps in our current knowledge, however, are exacerbated by perhaps the largest gap in our knowledge surrounding Puget Sound water quality: our understanding of the impacts of climate change. Current predictions incorporate our best estimates of future changes in the Northwest weather regime, based on global-scale models, combined with our understanding of the impacts of these changes on ecosystems. Early indications are that snowfall will decrease, snowmelt will occur earlier, and streamflow will be higher in some winter months and much lower in some late summer months. While new empirical data on climate change impacts continue to inform these projections, uncertainties in the data and model assumptions make it difficult to forecast effects precisely (Lawler and Mathias, 2007). Marine water temperatures are expected to increase in Puget Sound due to increases in air temperature and changes to freshwater inflows. Additionally, Puget Sound circulation patterns are likely to change, with associated impacts to dissolved oxygen (Mantua et al., 2007).

What these predictions mean to water quality in Puget Sound is unknown. However, it is likely that current infrastructure that supports our water, stormwater, and wastewater systems will be affected and could impact the transport, frequency, and duration of pollutants reaching Puget Sound water bodies. It is also likely that current accepted "knowns" about Puget Sound pollutants will be rendered obsolete in the face of these changes.

Science Question 2 (S2): Management Approaches
Addressing Water Quality

A. What are the main scientific findings relating to management approaches and their documented effectiveness in Puget Sound?

Management approaches to water quality in Puget Sound include preventive and remediation measures for point discharges (such as wastewater treatment, industrial treatment, and confined animal feeding operations) and for non-point source pollutants from stormwater runoff. Preventive measures include land conservation, structural and non-structural source controls, design standards, best management practices for a variety of land use activities, public education, chemical bans, regulation, and enforcement. Remediation approaches include treatment, retrofits, operations and maintenance, and cleanup of more difficult nonpoint source or legacy pollutants in sediment.

Stormwater
Modern stormwater drainage standards did not begin to come into effect in the Puget Sound region until 1995. Most of the developed land in Puget Sound remains untreated for stormwater quantity and quality (see attached map reflecting an analysis of pre-1995 development in King County). Preventive and remedial measures for stormwater include structural and non-structural Best Management Practices (BMPs) which have varying degrees of effectiveness. Identifying and removing illegal connections of non-stormwater discharges to stormwater systems is considered to be effective in reducing contaminants entering the Sound. Stormwater prevention and remediation problems are compounded by the lack of interjurisdictional mapping of stormwater systems, which can hamper efforts to clean up accidental spills. Most current stormwater management methods utilize site-specific source controls, rather than landscape-scale methods to analyze stormwater management and impervious surface area.

Source control measures
Source control measures include programs that prevent pollutants from being available for transport by stormwater, and programs that reduce the use and availability of pollutants in the environment. National

Pollutant Discharge Elimination System (NPDES) permits for construction, industrial, and municipal operations require source control elements such as surface water pollution prevention plans, spill control plans, and educational programs for proper handling and disposal of waste products. Non-structural source controls are difficult to verify or enforce under current regulations. Measures have historically been unevenly implemented and have had varying effectiveness at controlling stormwater pollutants (Duke and Chung, 1995). Some examples of specific source control measures include [Authors request more information here]:

• Vacuum-assisted street sweeping reduces pollutant washoff and may remove up to 80% TSS (Sutherland and Jelen, 1996, Breault et al., 2005). Street sweeping methodologies have improved.
• Local conservation districts typically work with agricultural operators to reduce water quality impacts from farming practices.
• Land based (ag BMPs, pesticide reduction, pharmaceutical take-back programs), creosote log removal.
• Airborne.
• Oil spill prevention and cleanup.

Treatment measures
A variety of stormwater treatment techniques are implemented by jurisdictions in the Puget Sound region. As discussed in above, stormwater treatment techniques started being implemented around 1995, with the first Stormwater Management Manual for Western Washington (Ecology Manual) (Ecology, 2005).
Techniques listed in the Ecology Manual are most often used today; however, many jurisdictions use equivalent manuals specific to their areas or have not yet adopted the Ecology Manual.
Generally, stormwater treatment is now required for new development and redevelopment that meets certain minimum thresholds. Treatment techniques and requirements have evolved over the last decade along with technical understanding of stormwater impacts. Still, most of the Puget Sound basin remains untreated because stormwater treatment requirements were not in place when the bulk of the region's development occurred. In these areas, stormwater treatment retrofits are sometimes incorporated with redevelopment of individual properties. Stormwater retrofit techniques are similar to traditional structural stormwater BMPs installed when properties are newly developed.

Traditional structural stormwater BMPs. The level of treatment provided by structural stormwater
BMPs is highly variable and depends on many factors including design,

maintenance, and influent conditions (Geosyntec and Wright Engineers, Inc., 2007). A recent study analyzed BMP treatment system performance for six BMP categories: detention basins, biofilters, hydrodynamic devices, media filters, retention ponds, and wetland basins (Geosyntec and Wright Engineers, Inc., 2007). The study observed that:

• BMPs appear to be most consistently effective in the removal of Total Suspended Solids (TSS).

• Total phosphorus appears relatively difficult to remove with existing methodologies, with the exception of media filters and retention ponds.

• Structural BMPs are widely variable in the differences between influent and effluent for total nitrogen. In three BMP categories, the effluent had significantly higher total nitrogen concentrations than the influent.

• There is a significant difference between influent and effluent event mean concentrations (EMCs) for dissolved zinc. However, three categories of BMPs indicated the effluent was significantly greater than the influent.

• There was not a significant difference between influent and effluent EMCs for dissolved copper, with the exception of biofilters and retention ponds where effluent concentrations were less than influent.

Current design and application of BMPs for stormwater are not demonstrated to consistently achieve water quality standards in receiving waters, nor are water quality standards for BMP design explicitly stated in most watersheds. Where Total Maximum Daily Loads (TMDLs) exist, treatment and source reduction requirements have been established that are typically presumptive and not linked to achieving specific numeric standards. Coupled with the limited or absent water quality monitoring conducted in many of these basins, this presumptive approach prevents the possibility of drawing scientific conclusions on TMDL/water quality plan effectiveness. (Washington State Department of Ecology, http://www.ecy.wa.gov/programs/eap/models.html.)

Additionally, as stated in GeoSyntec et al., 2002:

Direct comparisons between stormwater quality and the water quality criteria should be interpreted with caution because the effects of receiving water hardness levels do not account for mixing and dilution in the receiving waters or for such comparisons on heavy metals. This is especially true when the stormwater discharge is very small relative to the receiving waterbody. The variable nature of stormwater quality further complicates comparison to water

quality standards.

Low Impact Development methods: Low impact development techniques for stormwater management include the installation of features that attempt to mimic natural hydrological conditions, such as porous pavement, infiltration facilities, rain gardens, and other techniques (Puget Sound Action Team, 2005). Limited research has been conducted on the effectiveness of low impact development techniques to improve water quality.

Other measures
Following are examples of additional measures to reduce the negative effects of stormwater, along with
some of the successes and limitations of these measures:

• Interjurisdictional Coordination and Mapping: Potential for acute impacts exists due to lack of explicit mapping of interjurisdictional drainageways. For example, in the Urban Growth Areas of Snohomish County, over 800 miles of pipes, culverts, and ditches comprise the drainage system. It is possible for a diesel spill on Interstate 5 to flow through Snohomish County, then through the City of Marysville prior to discharge to the Snohomish River without clarity on the points of connection between each jurisdiction's drainage systems. This situation may limit the ability to quickly respond to landside hazardous substance spills.

• Illicit Connection Removal Programs. Wastewater, industrial, or other non-stormwater connections to stormwater systems have the potential for acute impacts to receiving waters. Since 1995 when the first Phase 1 NPDES municipal stormwater permits were issued, removal of illicit connections has been a requirement. While the cumulative number of illicit connections is unknown, professional judgment indicates that the potential for acute impacts was reduced by removing such connections. Most Phase 1 jurisdictions have evidence of significant reductions in fecal coliform bacteria and other constituents as a result of focused tracking and removal of illicit connections.

• Inspection and Enforcement: The effectiveness of regulatory programs in protecting water quality is not well known due to challenges in enforcement. State agencies and local governments lack staff to ensure that permitted facilities are constructed and operated as designed. For example, Ecology inspected 434 of more than 2,000 industrial permitted sites in the Commencement Bay and Lower Duwamish areas during 2006. There is not enough staff to annually visit or inspect facilities with industrial permits (Ecology, 2007).

[Reviewers/authors have stated the need for more findings in the following topics]

• Stormwater management at a landscape scale: [findings about reduction of impervious surface, avoiding compaction, and the need to manage at a landscape scale, rather than site-by-site, could be inserted here.]

• Limitation on impervious surface, and protection of ecologically functional areas:

• Interface with small agricultural and landscape operators:

• Spill prevention:

Wastewater

Secondary treatment of wastewater at municipal wastewater treatment facilities is effective in reducing loads of biodegradable organics, suspended solids, and fecal coliform bacteria (Metcalf and Eddy, 2005). Only one wastewater treatment plant discharging directly to Puget Sound includes denitrification; all other plants use secondary treatment which is not designed to remove constituents such as nutrients, toxics and endocrine disrupting compounds (EDCs). There is growing evidence, however, that traditional biological wastewater treatment can partially and/or completely remove some EDCs (Jiang et al., 2005, Nasu et al., 2001).

Well sited, well designed and constructed on-site wastewater systems are effective in removing pathogens from human wastewater. However, on-site wastewater system siting standards, while accounting well for human health, do not generally account for the condition of receiving waters, such as nutrient limitations. Technologies for nitrogen removal from on-site systems are not routinely utilized at this time, increasing the challenges of adequate treatment in areas subject to hypoxia and other side effects of excess nutrient discharges.

Technologies are available to effectively reduce the discharge of nutrients and toxics:

• Membrane bioreactor (MBR) technology reduces toxic compounds and EDCs more effectively than conventional secondary treatment (Lesage et al., 2005).

• Ozonation, ultraviolet radiation, and advanced oxidation processes can effectively reduce many trace compounds (Jasim et al., 2006, Ried et al.,

2005).

• Tertiary wastewater treatment and wastewater facilities that produce Class A reclaimed water can achieve greater levels of both nutrient and contaminant removal because of their frequent use of membrane filtration and other advanced processes (Ngheim et al. 2004, Wintgens, et al. 2002).

Industrial wastewater treatment systems are designed specifically to deal with the industry's unique waste stream. Increasingly, industrial discharges are being diverted into municipal systems following pretreatment to make the waste compatible with municipal domestic waste.

[Authors/Reviewers note that a discussion of findings on mixing zones and their effectiveness or limitations could be added here.]

Contaminated Sediments

[Authors suggest an analysis of the effectiveness of cleaning up contaminated sediments relative to cost,
and under what conditions. Issues include historic liabilities and the potential for Puget Sound-wide
regulatory agency alignments on strategies, limitations of liabilities and prioritized mitigations.]

B. How is the effectiveness of management techniques measured and documented?

Effectiveness of management programs is generally measured and documented with water quality monitoring, numbers of water quality complaints received, and operation and maintenance tasks completed.

The degree to which monitoring occurs depends on the funding, staffing, and often regulatory requirements. Current monitoring programs include comprehensive ambient monitoring programs such as the Puget Sound Ambient Monitoring Program, a variety of state monitoring programs, Phase 1 jurisdictional efforts, and monitoring required under the variety of NPDES permits or CERCLA/RCRA compliance conditions at the jurisdictional and industry level. A variety of compilations are available on the state and local jurisdiction web sites. There has also been important work done by the Water Environment Research Foundation (WERF).

In general, wastewater treatment plant operators routinely monitor water quality to document NPDES compliance. Annual reports submitted to the

Washington State Department of Ecology summarize water quality monitoring results for compliance. The Washington State Department of Transportation also submits annual monitoring reports to Ecology in accordance with their NPDES stormwater permit.

C. Gaps in our understanding

The largest current gap is the absence of an overarching ecosystem monitoring program that links measurable pollutants to intended outcomes to expenditures so that more accurate estimates of effectiveness and cost-benefit can be obtained. The following represents a very partial list of gaps in understanding related to management approaches to water quality improvement in Puget Sound:

• Connection between a suite of BMPs and numeric water quality standards and then to protection of the designated uses for a specific water body.

• Effectiveness of standards for achieving water quality health.

• Clarity and standardization of effective nitrogen removal technologies for on-site wastewater systems.

• Measured effectiveness of stormwater retrofit approaches that ensure contaminants are effectively removed or contained and not inadvertently transferred to groundwater.

• Extent of non-commercial agricultural livestock wastes and nursery discharge in rural and urbanizing areas.
Policy Question 1 (P1): Policy Approaches to Address Water Quality in Puget Sound

A. Existing regulatory or management programs

The Federal Clean Water Act (CWA) (1972) is the legal driver for the regulations and management programs that are in place to protect and restore water quality in Puget Sound. The CWA establishes the framework and minimum requirements for setting effluent limitations and water quality and sediment quality standards that address dissolved oxygen, nutrients, pathogens, and a limited array of toxic compounds. Washington State has used its authority to establish water quality and marine sediment standards unique to the state.

The Washington State Department of Ecology implements the CWA National

Pollutant Discharge Elimination System (NPDES) permit program. For the most part, NPDES is the program that covers water quality issues for stormwater, wastewater, and industrial discharges in the state.

In addition to the CWA, the Federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); the Federal Resource Conservation and Recovery Act (RCRA); and the state Model Toxics Control Act (MTCA) drive the cleanup of contaminated sediment and groundwater, which are known to be sources of water quality pollutants in Puget Sound. CERCLA and RCRA are carried out by the U.S. Environmental Protection Agency. Federal and state programs have made progress in addressing a number of contaminated sites, but the requirements are extensive, expensive, and time consuming. The programs are facing new challenges associated with recontamination of remediated sites, for example the Thea Foss waterway in Commencement Bay.

Other regulations that manage water quality indirectly include the federal Endangered Species Act (ESA) (1973); the National and State Environmental Policy Acts (NEPA/SEPA); and the Washington State Shoreline Management Act.

Specific regulatory and management programs operating in Puget Sound are described as follows:
[Reviewers note that more information on CWA 319 programs for non-point source control could be
included.]

Stormwater

• Most urban areas around Puget Sound have established stormwater drainage utilities of some type to fund maintenance and operation of municipal stormwater systems and capital projects. These utilities develop Comprehensive Stormwater Management Plans that are updated every 10 years.

• Most counties and cities must comply with NPDES municipal separated sewer (MS4) permits. Phase I (population over 100,000), and Phase II (population between 1,000 and 100,000) NPDES MS4 permits address water quality threats from stormwater through public education and outreach requirements; illicit discharge detection and elimination programs; reduction of pollutants from new development, redevelopment and construction sites; and pollution prevention and operation and maintenance programs for municipal operations.

• The NPDES permit program covers many other activities besides municipal stormwater, including highway runoff (WSDOT NPDES permit), general construction (construction sites over 1 acre), general industrial activities, general boatyards, sand and gravel mining operations, and others.

• The Washington State Department of Ecology 2005 Stormwater Manual for Western Washington
(Ecology, 2005) is used by many, but not all NPDES communities. Adoption of the manual or equivalency must be completed by August 2009 for Phase II communities.

• The federal Endangered Species Act allows incidental take of listed species. Federal agencies are required to consult with the U.S. Fish and Wildlife Service and National Oceanographic and Atmospheric Administration (NOAA) Fisheries (collectively known as "the Services") about their activities, including activities that could affect water quality, including stormwater runoff.

• Local conservation districts and water quality field agents with University Extension Services provide technical assistance to landowners in the management of runoff from agricultural and other rural activities.

[Authors/reviewers note the need for more description on advances that have been made in this arena, such as LID.]

Wastewater
• Most urban communities in Puget Sound have local or regional wastewater utilities to fund operation and maintenance of municipal wastewater treatment plants. These utilities develop Comprehensive
Wastewater Management Plans coincident with Growth Management Act Comprehensive Plan updates or as required by their authorizing legislation.

• Rural communities in Puget Sound do not have regional wastewater facilities, and residents typically use on-site wastewater treatment techniques for sewage treatment. Local and state health departments regulate on-site wastewater systems.

• Municipal wastewater treatment plants and industrial treatment plants must comply with NPDES permits for wastewater discharges. These permits outline requirements for discharge limits (frequency, concentration of key constituents, and volume), as well as water quality monitoring to document compliance. Few plants are required to monitor nutrient concentrations in

effluent.

• Municipal wastewater treatment plants are treating waste streams from industrial facilities, following pretreatment to reduce constituents that are not easily treated in the municipal waste stream, including metals and other toxic compounds (Metcalf and Eddy, 2005). Municipal operators are required under their NPDES permits to ensure waste from industrial facilities does not adversely impact the receiving water bodies where treated municipal sewage is discharged.

[Authors/reviewers note the need for more description on advances that have been made in this area.]

Sediments
• Federal and state cleanup programs administered by the EPA or Ecology under CERCLA, RCRA, and
MTCA address contaminated freshwater and marine sediments through voluntary and mandated cleanup programs. These programs address the threat of sediments containing a number of legacy contaminants that impact water quality and can bioaccumulate in aquatic organisms.

B. Limitations of existing programs

Despite the number of regulations and programs designed to address water quality in Puget Sound, there are still receiving waters that are not achieving the existing standards (see discussion in Memoranda S1 and S2). Limitations of existing stormwater, wastewater, and other specific water quality programs are discussed below, but a number of general themes emerge from the review of these programs:
• The lack of integrated planning between stormwater, wastewater, non-point source control, and water supply has led to geographic gaps in coverage and functional gaps in how well programs perform.
• The pursuit of separate goals (and segmented programs and standards) to address human health and ecosystem constraints has led to the design and operation of facilities that do not address both objectives effectively.
• Historically, land use planning has not been strongly influenced by the provision for water supply, wastewater treatment, or stormwater management from an ecological perspective. More typically, land use decisions determined how water supply, wastewater disposal, and stormwater management would occur.
• Many jurisdictions lack funding for adequate enforcement and outreach programs. The training of staff for preparing or reviewing designs, monitoring, and conducting enforcement is highly variable.

• Additionally, it is not known whether the existing standards are sufficient to be protective of aquatic communities, particularly for nutrients and toxic compounds.

Stormwater
The focus of stormwater treatment until the last two decades has largely been quantity-based for flood control, and secondarily for water quality. In the freshwater system, the historic focus on controlling quantity has had some positive ecological benefits through reduced flooding, erosion, and sediment transport. For the most part, there has been very little water quality monitoring to address the effectiveness of stormwater treatment on receiving water conditions. To date, Phase I and Phase II NPDES permits have not required monitoring (Ecology, 2007a, 2007b). Key findings include:

• The CWA NPDES regulations treat stormwater as a point source although stormwater behaves more like a non-point source.
o The application of BMPs is presumed to achieve water quality standards, which may be true in some situations, but not in others.
o There is no requirement for analysis of the effectiveness of BMPs to meet the water quality standards in the specific water body which will be receiving the BMP-treated stormwater, although current Phase I permits attempt to make progress in the linkage of select BMPs and loading reductions.

• With the uncertainty surrounding BMP effectiveness, a currently contentious aspect of the NPDES MS4 permits pertains to the exposure of municipal stormwater dischargers to third-party lawsuits for failure to meet water quality standards that are unachievable with current programs, policies, projects, or funding levels. [Authors/ reviewers note the need for more information on this issue.]

• Stormwater quality and quantity are tied to land use and transportation, yet they are not currently planned together.

• Existing stormwater BMPs prescribed in Ecology's Stormwater Management Manual for Western
Washington (Ecology, 2005) are not effective at removing all of the constituents associated with stormwater runoff from new development. In general, most are fairly effective at removing total suspended solids (TSS).

• Water quality threats from urban stormwater constituents such as polynuclear aromatic hydrocarbons (PAHs), dissolved metals, phthalates, and other compounds are not being addressed by existing regulations.

• Stormwater treatment and flow control requirements have focused almost exclusively on new development and construction activities, and have not dealt in any meaningful way with existing (pre- 1995) urban development in most areas.
o Most of the urban development in the Puget Sound region occurred prior to 1995 (prior to current stormwater manuals). Unless retrofitted with controls, this development provides no or minimal management of stormwater (see representative map provided in the response to Question S2.
o Retrofitting has been attempted in some portions of Puget Sound, but these "fixes" are frequently costly and implemented in a fragmented way with limited effectiveness.

• NPDES Phase I and Phase II stormwater permits are issued to individual government entities, leaving gaps in geographic coverage.
o Urban areas below the Phase II threshold (less than 1,000 people and a minimum density) are not covered under NPDES. The vast amount of land area of Puget Sound counties is not covered by permits.
o Federally recognized Indian Tribes are not required to obtain NPDES MS4 permits, and they operate under different water quality guidelines.
o Federally owned lands (U.S. military, Bureau of Land Management, National Park Service, and other federal agencies) are not required to obtain NPDES MS4 permits but do need to comply with federal water quality standards.

• NPDES application of requirements is inconsistent in the same watershed.
o Phase I and Phase II requirements are different (reflects the phased implementation of requirements).
o Washington State Department of Transportation operates under a different NPDES MS4 permit.

• There is no area-wide application of CWA NPDES for stormwater in watersheds or areas with known water quality problems.

(Somewhere in here needs to clarify that current stormwater efforts focus on future development rather than redevelopment of existing problem areas.)

Wastewater
Municipal wastewater treatment (WWTPs), combined sewer overflows (CSOs), reclaimed water, and septic systems are focused mostly on removing pathogens, biochemical oxygen demand, and suspended solids for the primary objective of protecting human health. Although treatment for ecological purposes (removal of nutrients) is understood, nutrient removal has not become standard practice, as most systems will face costly upgrades to meet

increasingly stringent effluent criteria. [Authors/reviewers note the need for more description of how this is changing.] Municipal waste operators conduct regular water quality monitoring to document compliance with NPDES discharge permits and water quality standards. Key findings include:

• There is good geographic coverage of WWTPs around Puget Sound at secondary treatment levels. [Authors/reviewers request clarification on whether this is widespread in Puget Sound or confined to highly populated areas.]
o WWTP upgrades previously could use state revolving fund money to pay for implementation of secondary treatment, but very little (or NO?) money is now available through this mechanism.
o Current WWTP upgrades face funding shortages in non-urban areas because most of the funding is through local sewer utility fees.

• The discharge of toxic compounds, such as pharmaceuticals, presents an emerging challenge for treatment in municipal systems, because some of it is discharged in human waste, is present in very low levels, and is ever-changing in composition and increasing in number and complexity. Sampling protocols are largely undeveloped and testing is expensive, treatment options are expensive, and existing regulatory and testing procedures do not address these pollutants.

• The reuse of treated wastewater has been developed as an alternative to marine and freshwater discharge. Reclaimed water can reduce pollutant discharges and may serve as a water conservation option. Reclaimed effluent is being utilized for wastewater treatment plans of various sites such as Lacey, Olympia, Tumwater, Thurston County (LOTT), King County, and Sequim; however, there are a number of barriers that hinder its widespread adoption:
o Water supply planning is not required to include reuse as a significant component. Nonpotable demand is not adequately accounted for as a separate demand in water supply planning.
o Exclusivity of service area may give water utilities veto over water reuse in their areas; water reuse is viewed by some water utilities as competition for their customers.
o Pricing policies are widely varied from free to equal to potable rates; cost recovery policies are not uniform; some areas of the country charge reclaimed water at 80% of potable regardless of the cost of production; equity for cost allocation between wastewater and water supply customers is unresolved.
o Liability for the use of reclaimed water is an unresolved issue for the producer, for the water utility if they become a purveyor of reclaimed water, and for the user.
o If the WWTP operator is required to reduce discharge through production of

reclaimed water, the only real cost for supply is the distribution system (purple pipe), but due to location of reclaimed sources this can be high.
o The benefit cost (triple bottom line) analysis of reclaimed wastewater reuse versus tertiary treatment to reduce treatment plant discharges is unknown.
o The Washington State Department of Revenue has denied sales tax credit to facilities built to reclaim and reuse wastewater. This represents a significant barrier because the offset of taxes has the potential to be sufficient to fund the facilities.

• Methods for treating wastewater to Class A reclaimed water standards, and tertiary treatment for nutrient removal are known. The cost of providing this level of treatment may be modest. However, the challenge with reclaimed water is the cost of the distribution system for the use of the reclaimed water and the economic impact to existing water purveyors of introducing an additional source of water into the current water supply system (King County 2006- King County 2006. Regional Wastewater Services
Plan Comprehensive Review and Annual Report, Chapter 7, Water Reuse Policies).
o A paradox exists that to fund higher levels of treatment with local financial resources, greater population densities are needed to keep utility rates affordable, which drives the need for higher levels of treatment. This is especially problematic in areas that already present risks to Puget Sound water quality health but cannot support the densities necessary to make high levels of wastewater treatment affordable.
o GMA helps steer growth into already urbanized areas, which goes some way toward helping reconcile population density and affordable WWTP facilities (King County, LOTT). Conversely, where GMA has allowed density in ecologically sensitive areas, wastewater treatment costs are high.

• While secondary treatment has been the standard for years, higher levels of treatment and reduced discharges are now being driven by the Washington State Department of Natural Resources (WDNR), manager of the state's tidelands and shorelines. An inconsistency exists between WDNR and Shoreline Management Act interpretations regarding the designation of wastewater outfalls as water-dependent uses or non-water-dependent uses. Designation as a non-water-dependent use opens the door to additional options for wastewater discharge, such as land application of biosolids or reuse of wastewater.

• "Flow blending" while maintaining basic secondary or more restrictive treatment requirements makes affordable higher levels of treatment of base flows, and overall reduced loads. Flow blending involves treating baseflows to a higher standard and then blending them with storm flows, which are treated

at a lower standard. The aggregate result is overall lower loadings over the traditional secondary treatment approach.

Wastewater: Combined Sewer Overflows
• The current state standard is no more than one uncontrolled overflow per year per CSO outfall, compared to the current federal standard of approximately four uncontrolled overflows per outfall per year.
o We know how to design, operate, and maintain CSO facilities to meet current uncontrolled overflow standards.
o CSO treatment is very costly.
o CSO programs are very expensive and not generally driven by the overall achievement of water quality standards, but to achieve a standard based on the number of untreated overflows allowed per year.

• CSO separation programs were generated under the theory (prevalent at the time) that rainfall runoff was clean relative to wastewater and could be used for dilution. However, numerous studies of nonpoint source pollution (Response to Question S1) have shown that this is not always the case.
o In most areas, adding stormwater to the combined sewer system is not now allowed, except in special cases.

• State treatment standards for CSOs are inconsistent with stormwater requirements for new development as determined by solids removal efficiencies.

• Sediment contamination resulting from previous discharges at CSOs is being addressed through CERCLA remediation in some geographic areas of Puget Sound.

Wastewater: On-site Sewage Systems
• The standards for septic system design do not typically address removal of nutrients and toxic compounds.

• Septic system siting standards do not address specific receiving water conditions, including nutrient limitations.

• Regulations for septic system performance are clear and achievable. However, inspection and enforcement do not typically occur unless problems with septic leach field failures can be observed.
o There is no consistent system for maintenance and operation of septic systems.
o There is a lack of funding and alternatives for failing septic systems (state laws enacted in 2007 now provide for the formation of septic system utilities).

• Regulatory oversight by the Washington State Department of Health (DOH) and local public health departments is affected by the limitations of permit-fee based funding. Also, human health has generally been the primary goal of on-site systems although critical areas setbacks have been included in state design standards for on-site systems. Legislation adopted in 2006 established new laws requiring the 12 counties surrounding Puget Sound to: (1) identify "marine recovery areas" where failing septic systems threaten water quality; (2) locate and track those systems that threaten public health; and (3) work with system owners to make necessary repairs. (http://www.martenlaw.com/news/?20060329-failing-septic-systems) [Authors and reviewers note the need for more information on the status of implementation of this law.]

Airborne Pollution
• There is growing evidence that air deposition of some pollutants, mainly in the form of fine particulates, can be significant (phthalates, mercury, arsenic, cadmium, etc.). There is no mechanism to deal with this type of source and the link to air quality standards. Air pollution is monitored by the Puget Sound Air Pollution Control Authority. [Authors/reviewers note the need for more information for this subject.]

Direct Marine Pollution

• The cruise ship industry is growing in Puget Sound, with six cruise lines using Seattle as a port-of-call. The Northwest Cruise Ship Association has a signed Memorandum of Understanding with Washington State Department of Ecology and Port of Seattle, outlining procedures to be followed for waste management, including discharges to marine waters.

• The US Coast Guard has a primary role in the enforcement of federal regulations pertaining to marine traffic.

• The Shoreline Management Act has been used to protect shorelines but also allows for water dependent uses (e.g., docks, marine commerce) which have known or strongly suspected sources of environmental degradation (e.g., use of creosote, bilge water disposal).

• Much effort has been spent on the need for a tugboat at Neah Bay to provide support and prevent catastrophic spills. Funding for this program has been difficult to maintain.

Land Use Planning
[Authors note that this issue is not addressed in detail as it is the focus of the

land use/habitat paper.]

• The Growth Management Act (GMA) advanced the integration of land use planning with water resources to the extent that critical areas are specifically addressed.

• GMA contains a balancing provision which results in some cases of environmental degradation to accommodate growth.

• The objectives of GMA to reduce urban sprawl overlap with findings that expansion of impervious surfaces impairs stream hydrology and habitat, and may impair water quality.

• Water supply, wastewater treatment, stormwater management, and land use planning have not been well integrated within localities in Puget Sound.

• Land use planning has been a strongly held purview of local governments, which makes large-scale land use planning for the protection of large geographies such as Puget Sound difficult. GMA and shoreline management have made some progress in guiding local land use planning

C. Other types of plans or programs used in other locations to address water quality; documented effectiveness

Source Control
REACH is a new European community regulation of chemicals and their safe use (EC 1907/2006). It deals with the "Registration, Evaluation, Authorization and Restriction of Chemical Substances." The new law came into effect on June 1, 2007, to improve the protection of human health and the environment through the better and earlier identification of the presumed hazard of chemical substances. In the ideal, those substances with high hazard would be phased out in favor of alternatives with lower potential to cause harm to people or the environment.

[Authors/reviewers note the need for more information relating to source control programs, including the Oil Spill Prevention Program.]

Comprehensive Watershed Planning
A few communities in the United States, most notably the Madison, Wisconsin area, are coordinating water resources planning through collaborative watershed initiatives. These initiatives take a holistic ecosystem approach to watershed management and share decision-making, collaboration, and engagement with a wide array of stakeholders. The EPA also expressed its

support for issuing NPDES permits on a watershed basis to meet overall watershed goals in a January 7, 2003 Policy Statement. Because these programs are so new, it is not known whether they have been effective.

Policy Question 2 (P2): Strategies to Improve Water Quality in Puget Sound
Water quality threats associated with our approach to urban living are ubiquitous. Our region is faced with a seemingly incompatible combination of (1) development approaches that do not incorporate multiple goals for human health and ecosystem protection, (2) increasing population levels, and (3) a desire to minimize or eliminate water quality threats resulting from additional growth. Current interventions and efforts, in total, do not appear to be effective in restoring all beneficial uses for water quality. Since 1995 when the first Phase I NPDES municipal stormwater permits came online, only a handful of urban streams or lakes have been removed from a 303(d) listing and more have been added. This does not imply failure of the permits, but rather underscores the difficulty of the charge for widespread pollution management.

A. Principles for water quality improvement in Puget Sound
The goal of improving water quality in Puget Sound by the year 2020 will require thoughtful consideration of the projects and programs most likely to move us toward that goal without losing ground on the stressors that continue to act on the ecosystem, including population growth and land conversions. The following preliminary principles and criteria are recommended to guide consideration in the development of strategies:

• Recognize that water quality improvement opportunities need to be closely orchestrated with land use/habitat and water quantity strategies and with the decisions of individual land owners. Water quality strategies alone, without consideration for the interrelated issues associated with land use and water quantity, cannot be expected to be successful. Success is unlikely without common intent across jurisdictions and cooperation and collaboration with property owners.

• Focus on ecosystem function improvement. Strategies that work with the natural ecosystem function (including human health) will have a better chance of being sustainable in the long term, and should be considered high priority. This includes strategies that reduce risks to human health, preserve natural ecosystem function, increase habitat complexity, and accomplish multiple objectives. For instance, low impact development techniques attempt to mimic the natural hydrology of a particular site and reduce the pollutants available for transport to receiving waters.

• Strategies for moving forward will need to embrace uncertainty; adaptive

management will continue to be an essential element of moving toward water quality health. Memoranda S1, S2 and P1 provided overviews of some of the gaps in what we know and the effectiveness of what we are doing. Climate change, economic crises, and shifts in modes of transportation may all dramatically affect strategies for water quality improvement.

• Control sources of known pollutants without introducing new and ultimately more problematic constituents (reduce, reuse, recycle).

• Certainty: Accelerate the implementation of known solutions that have already proven to be effective. Water quality strategies that are certain to make a positive difference in water quality and for which science clearly supports the strategy should be our highest priority. Those strategies with a high degree of certainty will likely have the most measurable results. Strategies with flexibility in implementation afford greater agility in responding to the uncertainties of climate change or economic disruptions.

• Increase feasibility for new and emerging strategies by resolving regulatory and technical barriers. Many of the water quality strategies identified in this discussion draft have regulatory or technical barriers that need to be resolved. Projects that have no barriers to implementation should be given highest priority. Greater feasibility, however, does not imply lower importance. However, less feasibility may suggest the need for greater study.

• Wherever possible, turn stormwater and wastewater into water resources.
• Focus on enforceable changes.

B. Preliminary recommended near-term strategies

The strategies listed below are endeavors that the team agreed could be enacted immediately because they are highly certain to have a positive effect on water quality in Puget Sound.

Stormwater

• Begin or accelerate retrofits of impervious surfaces in untreated urban areas. The majority of urban development occurred in the years prior to current stormwater management standards. This action would require jurisdictions to develop and implement a plan for the prioritized installation of water quality and water quantity treatment (retrofit) for existing impervious surfaces for which no or inadequate treatment exists. This would address the threat of pollutant transport from urban landscapes to streams, lakes, and marine waters of Puget Sound. It would reduce pollutant and hydrologic loadings from

existing urban land developed without stormwater controls. A high priority of the retrofit effort would be to reduce system connectivity (e.g., removing areas from the larger drainage system) without concurrently increasing potential flood damages.

The certainty of effectiveness and feasibility, not including funding considerations, are both high if the effort remains in the public sector. Coordination with private properties would introduce additional challenges both for near-term agreements and long-term maintenance, but could provide additional finances and is necessary to be successful. Financial resources required to meet this goal are expected to be at least on the order of the funds it took to move primary wastewater treatment to secondary treatment in the 1970s.

• Reuse stormwater generated from rooftops for non-potable uses. Rooftops constitute a significant portion of impervious surfaces in developed areas. State water rights law currently presents road blocks to the reuse of rooftop water. While rainwater collection is being promoted at both the state and local level to address urban stormwater issues, work is needed at the state level to amend water rights law to exempt the reuse of rooftop runoff. With the regulatory pathway cleared, significant progress could be made in addressing degradation that results from modified hydrology that occurs during land conversion. Benefits could include: (1) reduced volume of stormwater entering infrastructure, thereby reducing treatment facility sizes (including retrofit treatment sizes), (2) reduced demand on domestic water supplies, and (3) reduced water quality impacts resulting from stream channel peak flows.

• Coordinate with regional transportation efforts. As noted in the response to question S1, many pollutants in stormwater are associated with the byproducts of vehicle operation. There is a high level of certainty that reducing the total vehicle miles traveled would coincidentally reduce the amount of wear on brakes and the byproducts of that wear (such as copper and zinc), would reduce road wear, and would reduce vehicle emissions with potential for deposition and transport through stormwater. [Authors note the need to document the links from the threat to the action.] Clearly there is much work underway in the region to address this issue. Opportunities exist with efforts such as the Puget Sound Regional Council (PSRC) update of the long-range transportation plan with its new regional growth strategy, which will include analysis of climate change and environmental effects of actions. PSRC is only one of five current regional councils around Puget Sound. This effort will require extensive coordination to provide opportunities for water quality (and other Action Agenda) priorities to be considered in the growth and transportation plans.

• Mapping of interjurisdictional stormwater networks. Improved coordination and mapping of stormwater networks across jurisdictions is needed to reduce the potential for spills to travel across waterways through stormwater connections. This strategy would provide funding for mapping of stormwater drainage pathways from jurisdiction to jurisdiction throughout a watershed. The mapping would be provided in Geographic Information System (GIS) format and made available to first responders to provide more rapid response during spills of hazardous substances (landside). A number of jurisdictions have now mapped their systems in GIS format (an effort required under Phase I NPDES stormwater permits). NPDES Phase II jurisdictions are now required to map their systems. What is needed is both a requirement and funding to link up maps between jurisdictions whose drainage systems connect, to ensure that first responders can respond with maximum speed to address spills of hazardous substances entering drainage systems and minimizing the downstream impact of those spills. In addition, mapping and analysis of systems will provide essential data for system retrofits.

Wastewater
• Require tertiary or Class A wastewater treatment and reuse at WWTPs to reduce nutrient loadings. In nutrient-sensitive areas of Puget Sound, require either tertiary wastewater treatment, or treatment to Class A standards for reuse, to address the potential for hypoxia, algal blooms, and other related threats in nutrient-limited waters such as south Puget Sound. Effective wastewater treatment technologies exist to address nitrogen and other nutrient loadings. Benefits would be a reduction in nutrient loading to nutrient-limited areas of Puget Sound (tertiary treatment) and ability to reuse wastewater (Class A treatment) where uses (synergies) for the treated wastewater can be identified. Reusing treated wastewater has the added benefit of supporting the freshwater ecosystem through the reduction in dewatering.

The primary barriers would be the availability of funding, identification of access to customers for reclaimed water (Class A treatment), public acceptance, and state water rights law. This nutrient reduction strategy may only need to be used for critical parts of the year when receiving waters are most sensitive; also the increased expense in energy and other operating costs to the wastewater system must be considered in the balance. [Authors note more discussion needed on size parameters and cost impacts to small systems.]

Quantify the effect of advanced treatment on other pollutants.

• Expand outreach efforts to reduce emerging pollutants in personal care products such as EDCs and pharmaceuticals. Efforts to reduce EDCs and other

pharmaceuticals may have the potential for significant pollutant reduction prior to more costly investments in enhanced wastewater treatment systems. While additional technology exists to reduce EDCs through wastewater treatment processes, educational efforts are a feasible alternative to reduce EDCs input from human sources into the wastewater stream.

• Identify and replace failing septic systems, with particular focus in areas with demonstrated water quality problems such as shellfish closures and hypoxia. Building on the recently adopted state septic system utility law, establish septic system utilities to serve sensitive drainages throughout the Sound to ensure that existing septic systems are well maintained, but particularly in south Sound areas prone to increasing levels of hypoxia. The septic system utilities would provide a means to monitor septic system performance, increase the maintenance (and potentially longevity) of existing systems, and provide a mechanism for funding community systems in areas where densities, soils, or other site conditions preclude appropriate use of on-site wastewater systems. The utilities could also provide an increasing focus on emerging technologies related to nutrient removal. Existing on-site wastewater system design in Washington does not focus on nutrient removal. Benefits include the potential reduction in failed on-site systems and the related potential for untreated wastes to migrate to receiving waters or create human health risks. Coordination with the State Department of Health would be necessary.

• Review wastewater outfalls for potential decommissioning. At least 95 municipal marine outfalls, 166 industrial marine outfalls, and 60 individual marine outfalls discharge into Puget Sound (data provided by Redman, 2008). Because few existing wastewater treatment plants remove nitrogen and endocrine disruptors, and both represents concerns, a plan to explore possibilities for combining and potentially reducing the number of outfalls could yield reduced shellfish bed closures and other potential reductions in exposures, as well as efficiencies of scale in operations and costs.

Land Use
Focus protection efforts on intact and high-quality lands and watersheds. Continue the support, through grant programs and public-private partnerships, to set aside portions of Puget Sound watersheds that remain in pristine condition. Protect (through direct acquisition, conservation easements, or other mechanisms) high-quality watersheds in Puget Sound that support ecological functions and are largely intact. Preservation of intact ecosystems reduces the potential for pollutant loadings, and preserves existing hydrologic regimes with a high level of certainty. The Cascade Land Conservancy, The Trust for Public Land, The Nature Conservancy, and others are important partners in efforts to secure intact cosystems. This strategy may have important synergies

with both recreational and wildlife protection goals.

• Integrate land use and water resources planning. As covered in Memoranda S1, S2, and P1, land use and stormwater, wastewater, septic systems, and other water uses are inextricable intertwined and yet not planned together. Land use is a determinant in water planning but not the reverse. Yet we know that current methods for mitigating adverse effects from unlimited growthhave not prevented water quality degradation in Puget Sound. Whether Section 208 of the CWA or some other integrated planning method is put into use that gives priority to the protection of water quality, it needs to be done.

C. Regulatory strategies

Stormwater, wastewater, and land use
Increase the clarity of stormwater regulatory programs. A variety of adjustments in existing stormwater regulations could reduce the threat of pollutants contributed by sources that aren't fully captured by existing stormwater regulations:

• Expand municipal separated storm sewer system (MS4) permits geographically to include communities that fall under the population threshold for areas contributory to 303(d) listed water bodies. Phase I and Phase II permits do not include all the area within watersheds. While the permits have progressed, the need remains to synchronize efforts within watersheds to increase efficient use of limited staff and financial resources typical of many jurisdictions, and to adopt area-wide approaches to receiving water improvement.

• Address all surface water discharges in MS4 permits.

• Implement source control for existing developed commercial areas.

• Develop a strategy for treating urban pollutants such as copper, zinc, phthalates, and PAHs.

• Develop and implement creative approaches for agricultural-related discharges that reflect the realities of food production while reducing impacts from more diffuse rural land uses such as non-commercial livestock facilities and nurseries.

• Address the lag in adoption of new stormwater standards with state vesting laws (e.g, many properties may be "grandfathered in" and not subject to current regulations).

• Improve the rate of compliance with existing permits, which may require additional staff trained in both the science of stormwater and the realities of construction.

• Conduct monitoring to determine if permits and programs are effectively implemented and effective in intent (water quality improvement).

Correcting some or all of the above gaps could increase the effectiveness of our stormwater regulatory programs and resource use. [Reviewers noted the need for more description of the rationale for these recommendations.]

Establish watershed area-wide permits that focus on the multitude of discharges that occur in logical geographic areas, rather than discharge-specific inputs or jurisdictional boundaries. A legal methodology for doing this is already in place through Section 208 of the Clean Water Act. Improved coordination of the discharges, land uses, and human stressors that impact a watershed will lead to better answers for improving overall watershed health and potentially to a reduction in the number of discharges needed. The threat of unintended cumulative impacts potentially could be reduced by looking at the wastewater and industrial discharges in a larger context. This effort could potentially be used to bring federal, tribal, state, and local agencies into alignment both in coordination of efforts and in the development of flexibility and incentives to ensure that the rule of law is upheld, progress in water quality is achieved, and unintended regulatory burdens or processes on industry and individuals are minimized.

Source control
Implement more comprehensive chemical management in Puget Sound. One of the concerns of addressing or reducing contaminants is that the alternative may produce more unintended consequences than the contaminants. To address the human and environmental concerns associated with chemical manufacturing and use, the European Union has moved forward with a regulatory program that requires cradle-to-grave understanding of chemicals prior to allowing their import or use within the European Union. Implementation of the regulation is in its early stages, but a part of the effort that may be of immediate use to the Partnership is the “REACH” database that is being assembled to assess relative risks and potential for source reduction of commonly used chemicals. The intent of the program is to provide information to industries and the public about potential for chemical substitutions in different industrial, commercial, and residential applications, reducing the potential for more harmful chemicals to enter receiving waters (and other parts of the environment). The Partnership could begin by tracking the REACH database and bringing the available information to bear on decisions in the

Puget Sound region.

D. Recommendations for further assessment
There are gaps in our current understanding of the nature and transport of pollutants that cause water quality impairments and ecological harm. To lessen these gaps and move forward in our scientific understanding so that our strategies become more effective, the team has assembled the following preliminary list of recommended actions for discussion by the working group:

• Evaluate the role of sediment in water quality issues to better define the relative contribution of previously contaminated sediment to the overall health of Puget Sound, including the effectiveness of sediment cleanup programs, recontamination issues, and source control program effectiveness. Focus of the analysis would include the mechanisms for contaminated sediments presenting threats to the ecosystem and related risks, and the relative effectiveness of current regulatory programs in effecting cleanups opposite the cost of arriving at cleanup agreements. In addition, this analysis would include an evaluation of sediment cleanup standards for protectiveness of aquatic ecosystems, and development of protective freshwater sediment standards. In particular, there may be opportunities for expediting cleanup efforts that move public funds from contentious to cooperative efforts.

• Evaluate the link between stormwater pollutant loads and ecological effects. While it is clear that changes in stormwater hydrology affect aquatic organisms through damage to habitat, the effects of stormwater pollutants on the organisms themselves is much less understood. This study would be used to increase the understanding of the conditions producing high concentration storms as well as the frequency, duration, and magnitude of stormwater concentrations that harm and do not harm aquatic organisms. This study would be used to evaluate the effectiveness of existing stormwater BMPs, determine if they treat the right constituents or right part of the storm, and increase certainty in the selection of appropriate BMPs.

• Evaluate existing water quality standards. The question of the level of protection provided by our current water quality standards is at the core of any effort to determine the effects of pollutants on aquatic habitats. Existing water quality standards need to be reviewed for protectiveness. Site-specific water quality criteria should be developed for water bodies that may be more sensitive to the input of particular pollutants.

Washington State's toxic substances criteria, codified in the Washington Administrative Code (WAC) 173-201A-240 Table 240(3), are the basis of all regulatory assessments conducted by Ecology about the status of the state's

waters. Two basic concerns have been raised concerning these criteria: (1) the numeric values do not adequately prevent adverse effects to sensitive species; and (2) no standards have been adopted for some common pollutants. Ongoing efforts to establish cleanup goals and standards for Puget Sound will need to resolve each of these concerns. The strategy would include a recommendation that the Washington Department of Ecology: (1) review and modify as necessary existing standards (e.g., copper); and (2) adopt numeric limits for common pollutants (e.g., phthalates) for which there are no current state criteria.

• Improve predictive capability of ecosystem function through the development and refinement of modeling tools.
o Models that simulate circulation patterns in Puget Sound. [More description could be contributed to this issue.]
o Prioritization and performance assessment tool. Create a modeling tool that links scientific knowledge and management decisions in the recovery of Puget Sound to assess threats such as increasing nutrient loadings, increasing temperatures, toxic loadings, and complex food web interrelationships. The intent of the model (or series of linked models) would be to provide better capabilities for predicting ecological and human health outcomes of specific recovery actions in specific geographical areas. Actions could be prioritized based on their positive impacts. Barriers would include the challenges inherent in representing complex hydrodynamic, chemical, and biological reactions and the related uncertainty of predicted outcomes. The benefits include the deepening of understanding of processes that can occur when modeling is conducted. These tools will also point to the gaps and uncertainties in our knowledge, and the resulting uncertainties in the degree and speed of progress toward recovery as a result of our actions.
o Improve understanding of the dynamics and levels of nutrients in Puget Sound. Nutrients are creating an increasing challenge in Puget Sound, particularly in embayments and areas with low circulation. However, the dynamics and levels of nutrients from natural sources such as the Pacific Ocean and undeveloped landscapes are less well known. Additional questions pertain to:
o How increased nutrient levels affect the Puget Sound food web. In this case we lack both the basic monitoring information on the phytoplankton and zooplankton constituents of the food web and an understanding of the dynamics related to nutrient additions.
o How specific forms of nitrogen and phosphorus affect the biological community, or whether harmful algal blooms can be triggered by changes in the availability or form of nitrogen or other nutrients.
o The role of groundwater in nutrient delivery to nearshore areas.

How will we know when we're making progress?
The only way we will know that progress is being made to improve water quality in Puget Sound is to measure it against baseline conditions. There are limited water quality monitoring data available for all of the geographic regions of interest, so a carefully thought out water and sediment quality monitoring program should be established against which to compare future conditions in the fresh and marine water bodies of the Puget Sound basin. It is important to compile all of the existing data available, identify geographic or chemical constituent data gaps, and collect baseline data to fill the gaps. Long-term monitoring programs will need to be developed in the regions where actions will occur. In the near term, reductions in the number of 303(d) listed water bodies, the numbers of closed shellfish beds, the number of sites with highly contaminated sediments, and a reduction in vehicle miles traveled will serve as good indicators of progress toward overall water quality.

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From: Doug Brown

Date: 05/05/2008

Comment: I am with the Department of Ecology Air Quality Program. As I read through the WQ discussion draft I noticed there was very little information included on the air issues around deposition to Puget Sound as a path for toxic contaminants. Here is some additional information concerning airborne pollution to help expand the discussion paper.

INITIAL DISCUSSION DRAFT
WATER QUALITY TOPIC FORUM

Comments Airborne Pollution impacting Puget Sound

This is the discussion on Page 26 of the WQ paper under Policy Approaches.

Airborne Pollution
• There is growing evidence that air deposition of some pollutants, mainly in the form of fine particulates, can be significant (phthalates, mercury, arsenic, cadmium, etc.). There is no mechanism to deal with this type of source and the link to air quality standards. Air pollution is monitored by the Puget Sound Air Pollution Control Authority. [Authors/reviewers note the need for more information for this subject.]

An expanded discussion is provided below. This comes from the background

for the Air Deposition project that Ecology will be conducting for the Puget Sound Partnership to sample direct deposition to the waters of Puget Sound and from general Air Quality program information.

Tons of toxic chemicals are emitted into the air from mobile, industrial and commercial sources in western Washington each day. Some of these toxic pollutants are deposited to the waters of Puget Sound. Over time these toxins accumulate in the water, sediments and biota of Puget Sound.
The Control of Toxic Chemicals in Puget Sound report (Phase 1: Initial Estimate of Loadings) suggested that run-off from land surfaces and deposition from air (directly to marine waters) are the two most important avenues of contaminates to Puget Sound. In addition, the report found atmospheric deposition directly to Puget Sound to be an important source of toxics loading for polycyclic aromatic hydrocarbons (PAHs) and polybrominated diphenyl ethers (PBDEs). Atmospheric loading of PAHs and PBDEs directly to the marine waters and tidelands was found to be greater than or comparable to the loading from surface runoff. Due to these findings and the associated large data uncertainties for these toxic chemicals, the report recommended collecting and analyzing atmospheric deposition samples to better understand the atmospheric deposition rates to the waters of Puget Sound.
Sources of diesel particulate emissions in the Puget Sound are dominated by heavy-duty vehicles, construction equipment and marine vessels. These three source categories account for 79% of all fine particulate in the Puget Sound. Wood burning devices in the 11 counties adjacent to Puget Sound emit 9,700 tons of fine particulate each year. There are 900,000 wood-burning devices in these counties. There are 200,000 older, high-polluting woodstoves and inserts that account for 60% of the wood smoke pollution.
Deposition from the air directly into marine waters of Puget Sound appears to be an important source of loading for some of the chemicals of concern, including PAHs and PBDEs. Significant sources of PAHs include fuel oil related emissions from diesel vehicles, gasoline vehicles, marine vessels, and wood combustion.
Air monitoring for fine particulates related to combustion is conducted at several locations throughout the Puget Sound region by the Department of Ecology, the Puget Sound Clean Air Agency, the Olympic Region Clean Air Agency and the Northwest Clean Air Agency. There are federal and state standards for these fine particulates. The Department of Ecology also monitors toxic air pollutants at one site in Seattle and a subset of pollutants in Tacoma. Many of these monitored toxic compounds and metals are those of concern for deposition into the sound. There are no direct federal or state standards for most of these compounds. However, many of these compounds adhere to the fine particulates from diesel engines and wood smoke, so are

indirectly managed through fine particulate control and reduction programs

From: Peter Beaulieu

Date: 05/05/2008

Comment: The purpose of this note is to call your attention to three resources that should help in developing a Puget Sound management strategy and initial action strategy.

First, at the Edmonds forum one of the three breakout groups (Angie Thompson) noted the significance of the statewide Chelan Agreement as a model with positive and negative lessons regarding river basin management. Part of the history is that in 1990 the Legislature choked on water resources reform and deferred to an external and collaborative initiative, well underway, involving caucuses for each of the stakeholder groups. There must be a file on all of this, and a reader friendly brochure, but my contribution at the time was to prepare a detailed paper (including a "wiring diagram" for how the process was to work), which I gave to Angie. The Agreement established a dialogue between statewide issues (a structured panel of all the caucuses) and a sequenced second layer of WRIA level planning drills, beginning with pilot basin to be identified in Eastern Washington and another in Western Washington.

My paper was "The Chelan Agreement: Co-responsibility in Water Resources Management," for the 33rd Annual Conference of the Western Social Science Association, Reno, Nevada, April 24-7, 1991 (18 pages).

Second, I am mailing to you a piece of testimony I delivered to a review committee for the Puget Sound Water Quality Authority. I find that in late 1989 a Review Committee conducted public forums as part of a sunset review for the Authority, before it was folded into the Department of Ecology. My written staff level comments should arrive at your desk on May 7 or 8, but will be mailed today (May 6). There must be a file somewhere in Ecology with a final report incorporating many probably diverse views.

Look for my "Comments before the Puget Sound Water Quality Authority Review Committee," October 17, 1989 (8 pages).

Third, in the late 1980s (and prelude to item #1, above) the Legislature undertook an extensive and objective fact-finding mission with regard to all of the water resources issues addressed in you water supply issue paper (and more) and discussed at the Edmonds forum. The findings came in at least

one information rich volume (I think remember additional supporting volumes). There probably were a set of recommendations, and based on some of what I heard at Edmonds, much of this assessment is probably still current.

From my Chelan paper (above), I can identify this gold mine as: Shupe, Steven and Heidi Sherk, Washington's Water Future: The Report of the Independent Fact Finder to the Joint Select Committee on Water Resources Policy, July 1988.

From: Kathy Weed

Date: 05/05/2008

Comment: Attached is a memo we are submitting in response to the draft paper for the Water Quality Forum, in addition to the comments we already submitted on the web, which were submitted under the spot for "current knowledge" and "strategies to continue, add, or change."

See pdf:
08 05 05 Memo to Puget Sound Partnership on its draft Water Quality Forum paper

From: Peter Beaulieu

Date: 05/02/2008

Comment: Following the forum session in Everett yesterday, I have given some thought to four ideas that might help invent the institutional architecture of a sustainable effort toward a sustainable Puget Sound ecosystem. With a minimum of elaboration, let me simply pose four mutually supporting concepts for your possible interest. Not all of this is new.

1. Build a switchboard, not a new "layer". Avoid creating a dysfunctional new layer of activity by instituting, instead, a catalyst among the existing agencies.

This forum activity would not add to workloads, but instead would cause lead agencies to do better their existing duties, and in this way would lead to a rolling set of discrete "action packages," the first of which is the Action Agenda. One example in our region is the equally shared and collaborative Regional Freight Mobility Roundtable, of which the most prominent action package by government participants (all levels) is the FAST Corridor

Program which, in turn, consists of a system of separately sponsored and accountable, and still cooperatively supported, transportation projects. (Leadership Council member Dan O'Neal can elaborate.)

The I-405 Corridor Program succeeds because it does not add new work to that of resource managers; rather, it helps them together to do their current work better. Part of the "better" is in engaging the parties early in a broad geographic scale of thinking, both to hear the roadblocks early (future permit conditions), and at the same time to smooth the way for less myopic permit reviews, based on earlier systems level involvement. As part of a new kind of institutional architecture, the Record of Decision included an Environmental Element under which mitigation for altered runoff volumes can be mitigated with more effective and cost-effective off-site mitigation actions drawn from (otherwise unfunded) WRIA resource management plans.

A relational data base, or GIS maps with common registrations, is long overdue. In the 1960s the Puget Sound and Adjacent Waters Study developed by hand a set of hundreds of consistent maps for WRIAs and the Puget Sound basin as a whole. Might we at least match this elementary effort, with the technical tools we now have some fifty years later?

2. Invent an eco-conomy worthy of imitation in other regions. Treat federal any possible federal funds primarily as a centerpiece for assembling an ongoing partnership of local commitment and funds (again, the original FAST Corridor model).

Why not foster corporate donations toward a Trust fund on the grounds that the economy depends upon the attractiveness of our natural setting. Corporate engagement would help build the elusive street level commitment necessary to assure the social and political environment needed to act regionally in an eco-system sort of way at least some of the time. The Partnership should investigate the business model used in Richland to save the Hanford Project, by creatively diversifying the resource into a multi-party research center. Candidate research companies were recruited nationally to help save and diversify the economy by bringing with them, as part of each competing proposal, a second industry unrelated to the nuclear facility, e.g., Battelle competed successfully partly by starting an alfalfa production line, another firm brought to the area a potato processing plant.

In our Puget Sound region, the multiplicity of major existing corporations might be linked in an analogous way to our resource and to parts or all of the Action Agenda. This eco-conomy approach would not require much from,

say, Boeing, Weyerhaeuser, Microsoft et al. The Partnership need not confine itself to the obsolete federal grantsmanship model that sprang up around the Great Society of the late 1960s. Such private sector funds, if secured, should serve as seed money for something more home grown, more integrating, and more sustainable.

3. Think rolling "action packages" which then might include a so-called "final Action Agenda" if it is framed properly. The suggestion has been made that the "final Action Agenda" should be thought of more as a "formal Management Agenda," and made such by how it subjects itself to adaptive management. How can the Agenda remain "problem solving rather than project driven"?

The message is that only in this way will the commitment to adaptive management become a living reality, rather than a neglected line item. We do not need a slush fund for science projects, but we do need an ongoing guidance system, if only to ensure that limited funds are not themselves poured into one rat hole or another. Cost-effectiveness requires adaptive management (as does even basic effectiveness.) A shared learning approach – essentially continuing in a convincing way the forum approach already underway – would exist to create "action packages" for the Sound as a whole and for each of the highly diverse (varied priorities) action areas. The Action Agenda, as it is currently called, should include as an "action" a substantive commitment (more than rhetorical) to adaptive management, a dialogue between science and public and private policy. In this context the Agenda becomes one action package timed to merit Congressional attention, but this strategic action does not become the definition of the program.

Strategic choice theory, as it has been called, is a systematic and systemic way to reconcile the real world problems of simplicity versus complexity, urgency versus the need for information, commitment versus flexibility, and incrementality versus comprehensiveness. The only written resource I know of that graphically presents strategic choice – the way that things actually do get done – is Aids to Strategic Choice, by Allen Hickling, University of British Columbia, unpublished c. 1975), but there must be more recent work under his authorship.

4. Foster bite-sized and cumulative results. The Agenda should foster parallel pathways of analysis, decisions, and actions at a range of geographic scales.

The Puget Sound ecosystem, and its subsystems, are sufficiently complex to almost ensure that eyes will glaze over before anything new gets done. We

can avoid the opposite fallacies of random ineffectiveness and contrived crisis politics. (What would happen if we declared a crisis, and no one came?) Action packages can be both systemic and discrete, rather than fragmented. This is the crux of the "strategic choice" approach to complex systems. The I-405 Corridor Program, again, is a overall systems solution that is implemented through a sequence of actions that each make sense even if possibly stranded later to stand on their own. A good model in a time of chaotic budgets, etc.

The Partnership already is directing its attention to "action areas", and my only addition to this -- an addition I think is critical to success -- is to set up the process to work equally at two levels. That is, the action areas will be more successful if they work in dialogue with the Sound wide effort, rather than only as details within a Sound wide monologue conducted at 10,000 feet, as we say.

Each of the action areas should work from the clam beds and herring habitats up toward a relatively freestanding action agenda. Sound wide issues will be obvious enough, and can be seen as an alignment of local efforts in local areas. One function of the "switchboard" (item #1) is to organize alignments. Community engagement depends upon geographic immediacy. We might think of a sort of "institutional ecology" with its own food web of thriving success stories (and even a "human ecology" of stewardship that doesn't short change the next generation).
These are my thoughts. The key ideas are to think: (1) switchboard rather than layer, (2) eco-conomy beyond grantsmanship,(3) action packages rather than a final plan, and (4) cumulative efforts all within the Partnership's ecosystem context. In suggesting these notions about institutional architecture, I am also highlighting examples of success in our region.

From: Keith Grellner

Date: 05/01/2008

Comment: Please find below comments related to the above:

Page 3: There are local entities (e.g., Kitsap County Health District) that conduct pollution source tracking and correction, and have been doing so for many years. Many water quality improvements have been documented, included the re-opening of closed shellfish areas. This paper does not even recognize that these types of efforts have been taking place for up to 20 years in some localities, and some success has been realized from them.
Page 10, Septic Systems: New data concerning nutrients from onsite sewage

systems (OSS) from the UW as part of the HCDOP do not agree with these statements. Although OSS were not designed specifically to remove or reduce nutrients, minimum horizontal and vertical setbacks that have been enforced through state and local health codes since 1974 are showing that nutrient reduction does often occur in the soil surrounding drainfields, and that this reduction is up to 50% or more from nutrient concentrations measured in septic tanks.

Pg. 18, Waste Water: New technologies are routinely used as required by state code (WAC 246-272A) and have been since 1995. Anecdotal data shows that these existing and approved treatment technologies do reduce bacteria and nutrients. The state, however, does not conduct monitoring on these existing, approved technologies to document these treatment efficiencies and performance. While new technologies, such as MBR's, are welcome additions to the regulatory arena, existing technologies should not continue to be dismissed and overlooked.

Pg. 21, Wastewater: The document does not include or cite existing Health regulations for onsite sewage system design, installation, monitoring, maintenance and repair. State regulations have been in place since 1974, and some localities like Kitsap County have had onsite sewage regulations in place since 1961. These existing regulations should not be overlooked or dismissed.

Pg. 25, Wastewater Onsite Sewage Systems: Third bullet: this statement is wrong. There ARE some systems already in place to assure the monitoring and maintenance of onsite sewage systems --- Kitsap County has such a system, and other counties do too.

Pg. 32, Recommendations for Further Assessment: The State should develop and implement a program to monitor the effectiveness of all of the different types of onsite sewage systems with respect to existing local regulations. There is very little to no data concerning how effective existing OSS --- that have been constructed to meet current and past regulations --- are in reducing and removing bacteria and contaminants. Existing systems and regulations should not be overlooked or deemed inadequate without the data to support or deny these assumptions (as is happening now).

In summary, you get the impression by reading this document that this is the first time that pollution source tracking and correction, or regulations and monitoring of onsite sewage systems have been discussed, evaluated, or considered. This is simply not true. While progress can and should be made in this area, we should not overlook lessons and successes already learned and attained. We should use them to our benefit.

From: Jason Sharpley

Date: 04/28/2008

PugetSoundPartnership
our sound, our community, our chance

Comment: This email is feedback on the Initial Discussion Draft - Water Quality Forum Topic Paper...

pg. 25 under the Wastewater: Combined Sewer Overflows

This section only partially sites the State Rules correctly and incorrectly sites the Federal Rules. The section should be corrected taking into account the following for the State Rules:

WAC 173-245-015 requires "All CSO sites shall achieve and at least maintain the greatest reasonable reduction, and neither cause violations of applicable water quality standards, nor restrictions to the characteristic uses of the receiving water, nor accumulation of deposits which: (a) Exceed sediment criteria or standards; or (b) have an adverse biological effect"

WAC 173-245-020 (22) defines " 'The greatest reasonable reduction' means control of each CSO in such a way that an average of one untreated discharge may occur per year."

The state has interpreted these rules to be on an outfall basis. From section 015 above, we see that the discharges must meet water quality standards AND discharge less than one CSO per outfall per year on average (section 020).

The references to the Federal statues and rules should be corrected taking into account the following:

The Federal statue and rules are a little different from Washington State Rules as they DO NOT have a frequency requirement (as was stated in the paper). In addition, EPA interprets the rules to be on a system-wide basis and not on an outfall basis. The purpose of the Federal CSO Policy (which was codified) is to "expedite compliance with the requirements of the Clean Water Act." (Section A. Purpose and Principles) The Policy then goes on to "reiterate the objectives...2. To bring all wet weather CSO discharge points into compliance with the technology-based and water quality-based requirements of the CWA." It further elaborates on what they mean and spells out two discrete steps that must be taken. First, the agency must document and implement the Nine Minimum Controls. Second, it must develop and implement a Long Term Control Plan (LTCP). These LTCPs are the tools that "ultimately results in compliance with the requirements of the CWA." LTCPs are required to contain an alternatives analysis that "selects a control alternative sufficient to meet CWA requirements." This section (II.C.4.) of the policy elaborates on two approaches to comply:

a. "Presumption" Approach. This approach is presumed to meet the water-quality based requirements of the CWA provided the local permitting authority agrees with the data and analysis conducted. The presumptive approach may take the form of limiting CSOs to less than four to six CSOs per system, elimination or capture of greater than 85 percent of CSO volume on a system-wide basis, or elimination or removal of no less than the mass of pollutants identified as causing water quality impairment.
b. "Demonstration" Approach. This approach demonstrates that a "selected control program, although not meeting the criteria specified in II.C.4.a. above is adequate to meet the water-quality based requirements of the CWA.

So....the rules and statues can be summarized as follows:
STATE: Meet WQS and achieve an average of less than one untreated CSO per site per year
FEDERAL: Meet water-quality based requirements of the CWA

Hope this helps in clarifying the first bullet.

Also in that section:
Bullet one, sub-bullet two, can you identify what "CSO treatment is very costly" in comparison to???
Bullet two, sub-bullet one, can you provide a reference or re-word. The way it currently reads is incorrect, for CSS are designed to convey both stormwater and wastewater. (the statement is true if you were to be talking about sanitary systems - no stormwater except by variance)
Bullet three - please elaborate - are you trying to say they are more stringent, less stringent, or just saying they are different?
Bullet four - please provide references for this statement - it appears that you are drawing the conclusion that CSOs result in sediment contamination, which is not a valid conclusion.

Thanks - email or call me if you need additional clarification,

From: Derek Poon

Date: 04/27/2008

Comment: Thanks for the chat at the Water Quality forum.

As we discussed today, here are the EPA grants information plus some "Alternative Futures" background. Neither of them was discussed at the plenary discussions today, although EPA has substantial investments in both. I'll look at the Habitat and landuse report on this topic, plus

wait for your integrative report later.

Chico Watershed Alternatives Analysis
http://www.psat.wa.gov/Programs/growth/reports/Chico1.pdf
Willamette Alternative Futures
http://www.epa.gov/wed/pages/projects/alternativefutures/alternativefutures.htm

"The Puget Sound needs our help," said EPA's Miller. "And we can start at the watershed level by adopting smarter land use patterns and better management practices to protect water quality. These eight grants will also influence and advance natural resource protection throughout the Puget Sound Partnership's action areas."

EMBARGOED UNTIL 1:00 PM, WEDNESDAY, MARCH 26, 2008

Contact: Michael Rylko, 206-553-4014, rylko.michael@epa.gov
Mark MacIntyre, 206-553-7302, macintyre.mark@epa.gov

Eight Puget Sound Watershed Projects are Finalists for $4.5 Million in EPA West Coast Estuaries Initiative Funding

(March 26, 2008 – Seattle, Wash.) Puget Sound watershed protection efforts will get a $4.5 million boost, thanks to the U.S. Environmental Protection Agency's West Coast Estuaries Initiative. Eight cooperative watershed protection projects, encompassing broad coalitions of local and Tribal efforts, have been selected as finalists in the first round of focused funding under EPA's West Coast Estuaries Initiative.

The eight finalists were named today by Elin Miller, EPA Regional Administrator, at the South Sound Science Symposium in Tacoma. According to EPA's Miller, the Initiative grants will assist local and tribal governments in Puget Sound to protect and restore watersheds that are facing significant population growth and development pressures.

"The Puget Sound needs our help," said EPA's Miller. "And we can start at the watershed level by adopting smarter land use patterns and better management practices to protect water quality. These eight grants will also influence and advance natural resource protection throughout the Puget Sound Partnership's action areas."

Grants of up to $625,000 will fund watershed protection projects* led by Skagit, Whatcom, King, Thurston, and Clallam counties and the Squaxin Island Tribe. Proposed projects include: connecting watershed information to land use decisions; applying education programs and land stewardship incentives; evaluating the effectiveness of current zoning and regulations; acquiring land for habitat protection; protecting shellfish areas; and studying the sources and impacts of nitrogen pollution in sensitive marine areas. (*see: attached project summaries.)

WEI Background

The West Coast Estuaries Initiative (WEI) grant program is unique in targeting projects that connect watershed management and land use decision making to support the protection and restoration of high value Puget Sound aquatic resources. This is especially important in areas facing rapid population growth, increased development or other environmental pressures. Projects proposed included watershed scale planning and analysis and site specific techniques such as Low Impact Development and Smart Growth. All of the projects include strong collaboration with multiple stakeholders and project partners.

In all, EPA received nearly two dozen applications for the WEI program. WEI grants emphasize local, holistic watershed protection and management approaches. Grant funds will assist local and tribal governments in managing land uses while protecting watershed functions and values. Only local governments, special purpose districts, and federally recognized Indian tribes in the greater Puget Sound Basin were eligible to apply.

State agencies, institutions of higher learning, and non-governmental entities were ineligible to directly receive the grant awards; however, EPA encouraged tribes and local governments to solicit their participation as local partners.

FACT SHEET – EMBARGOED UNTIL 1:00PM 3/26/08

EPA West Coast Estuaries Initiative – Puget Sound Grant Finalists

Community Engagement for Effective Stewardship of Oakland Bay (Squaxin Island Tribe)($625,000)
Description: Squaxin Island Tribe and their partners will use innovative social marketing to re-tool an incentive program to

increase environmental stewardship and LID on private lands; develop a near shore mitigation bank; and implement land trust conservation activities to protect habitat. All this will be done in an effort to improve watershed health measured by an upgrade of harvest status to "approved" throughout the bay.
Partners: Capitol Land Trust, Washington Department Of Ecology, Washington Department of Health, Mason Conservation District D, Mason County Public Health, Simpson Timber, Taylor Shellfish, Washington State University.
CONTACT: John Konovsky 360-432-3804

Collaborative Storm Water Management for the Sequim/Dungeness Watershed(Clallam County)($538,048)
Description: Clallam County and their partners will implement an innovative bottom-up regulatory development approach to develop a Comprehensive Storm Water Management Plan and adopt Clearing and Grading and Storm Water Ordinances. They will assess storm water impacts by monitoring of chemical, nutrient, and bacterial pollutants; updates GIS database layers; and provide peer and public outreach as building blocks for the bottom-up approach.
Partners: Jamestown S'Klallam Tribe, North Olympic Peninsula Lead Entity, Dungeness River Management Team, Built Green of Clallam County, The League of Women Voters of Clallam County, Northwest Indian Fisheries Commission, Clallam Conservation District.
CONTACT: Carol Creasey 360-417-2423

Landscape Watershed Characterization of Four Watersheds using GIS (Thurston County)($624,675)
Description: Thurston County will complete watershed characterizations across the county watersheds to assess current functioning of drainage systems. The characterization will result in a prioritized list of sites for restoration and prioritization, storm water retrofitting and LID (including clustering and storm water BMPs). The results will provide a baseline to minimize the cumulative impacts of land use and outputs will be integrated into the County's Storm Water Plans, SMP, CAO and mitigation strategies.
Partner: City of Tumwater
CONTACT: Barb Wood (360)754-3355 x-6809

Birch Bay Watershed Action Plan: A Proposal for Implementing the Birch Bay Watershed Characterization and Watershed Planning Pilot Study (Whatcom County)($443,769)
Description: Whatcom County will implement the recommendations of the

Birch Bay Multi-Agency pilot study through design and implementation of a watershed-focused planning model for land use decision-making. This will be accomplished through constructing a preferred scenario for future development and identifying "workable" solutions (such as zoning or sub area amendments, development regulations, or inter local agreements with stakeholders) that recognize the unique issues of a sub basin prior to permit review stage. Outcomes will protect property rights and values while sustaining and restoring aquatic resources and watershed processes threatened by growth and development.
Partner: Washington Department of Ecology
CONTACT: Peter Gill

Skagit Alternative Futures Project (Skagit County) ($625,000)
Description: Skagit County will apply the "alternative futures" process to conflicts between ecosystem restoration, farmland preservation and growth management. The results of the process include changes to zoning, development regulations, surface water management and funding priorities for habitat restoration and farmland preservation in light of growth pressures and potential effects of climate change.
Partners: University of Washington PRISM program, WDFW, Skagitonians to Preserve Farmland
CONTACT: Gary Rowe
Highly Focused Stewardships Assistance in the Snoqualmie: A Model for Rural Watersheds(King County) ($580,301)
Description: Using a paired watershed approach, King Co will work with local land owners in the Patterson Creek and Raging River sub basins to target stewardship tools and incentives such as Public Benefit Rating System, Forest Stewardship and Farm Management Planning, Rural Stewardship Planning, dedicated restoration and BMP implementation funding, and direct acquisition of property to create contiguous reaches of protected and restored habitat by preventing land use conversion and maintaining forest cover and farming. Results will be compared to similar, non targeted watersheds.
Partners: Partnership for Rural King County, King Conservation District, Snoqualmie Watershed Forum
CONTACT: Logan Harris or Doug Williams

Regulatory Effectiveness Monitoring for Developing Rural Areas (King County) ($624,732)
Description: King County will study the effectiveness of current land use regulations at protecting aquatic environments in developing

rural areas by tracking regulatory implementation and corresponding changes in land cover, hydrology, water quality, channel complexity, and biology in 6 transitioning rural watershed and three reference watersheds. Results will shape recommendations on regulatory implementation and compliance and watershed response in an effort to inform King Co 2012 GMA review of land use regulations.
Partners: UW Urban Ecology Research Lab, USGS, WA Dept. of Veterans Affairs Veteran's Conservation Corp.
CONTACT: Logan Harris or Doug Williams

Quartermaster Harbor Nitrogen Management Study(King County) ($625,000)
Description: King County will evaluate the role of nitrogen in the lethal, low-level oxygen events in Quartermaster Harbor; identify and quantify sources; and model the effectiveness and costs of nitrogen management strategies and watershed BMPs. Information will be used to develop new nitrogen management policies for Vashon Island to recommend for incorporation into the 2012 King Co. Comprehensive Plan update.
Partners: DOE, Vashon Maury Island Groundwater Protection Committee, USGS, UW Applied Physics Lab and UW Tacoma.

From: Peter Beaulieu

Date: 04/25/2008

Comment: A special note to Martha Newman:

Picking up on my two remarks to you this morning, I would like to leave on the table for possible future rumination these four ideas (beginning with the two we discussed).

First, I mentioned the critical importance of someone (the PSP?) advancing GIS across agencies with common "registration" (or whatever the term is) to finally assure layered understanding of policy issues by policy boards (as well as supporting technical coordination).

Second, I proposed that, because of the uncracked nut of implementation for problems tracing back to confounding land use factors, it is critical to develop freestanding action agendas for each of the Puget Sound sub-basins (including in some carefully articulated institutional way their tributary WRIAs). I stressed that these six action agendas should be developed

alongside of and in dialogue with the overal Puget Sound agenda, not simply as subsets (their own "priorities" with some of these priorities in common and aligned with each other). In water resources issues it is necessary to work backwards from the eventual action agencies, not linearly toward these agencies as from problems now toward solutions later next year. (This backwards approach, with early and focused stakeholder engagement on a geographic basis, might even now begin to give shape to the caucus engagement that Ruckelhaus mentioned at the April 24, 2008 Regional Council annual assembly meeting last evening.)

Third (new), without elaboration here, let me plant the idea of doing something different than either historic "random acts of kindness" or the proposed "prioritized" issues. The third philosophy, "strategic choice," would angle toward separable but coherent "action packages" as the desired outcome, as compared to random acts of kindness or the the almost-but-not-quite successful prioritized IN-actions. There are a few successful examples of the strategic choice approach in our region.

Fourth, on citizen involvement and hoped for buyoff, let me recommend a book (a quick read) on nuclear waste disposal. In that case, the citizen component translates possibly into a proposed and continuing Trust to keep things on the table for several decades even as legislative and Congressional budgets lurch along in discontinuous two-year segments. For this possibly transferable lesson, see America's Nuclear Wasteland (Max Power, WSU Press, March 2008). Max worked on the Hanford project in Olympia for many years and is highly credentialed (Rhodes Scholar, prominent Regional Council staff member in earlier years, etc.). FOR EXAMPLE, one might imagine a three-part structure: (1) a trust being set up to help citizens keep Puget Sound in the spotlight, and whose ongoing findings/rumblings would feed into (2) a permanent caucus of accountable agencies as is already being assembled, and with both of these linked by (3) a credible and transparent risk assessment and risk management component which would be coopted by neither the mission specific agencies nor "the public". The risk assessment/mangement component would mediate between urgencies, information gaps, and budgets, to generate additional and doable "action packages".

From: Cindy Beckett

Date: 04/24/2008

Comment: I wonder if one of you would reply to my question? I have contacted the ECY office about this rating/compensatory system and asked who is

responsible to see to it. The reply was the same as always - "it's up to local government, and if local government does not do it, there's nothing they can do" ECY does not do a hands on thing, even if every wetland in a county is destroyed, they still adamantly claim they have no authority nor jurisdiction. It seems very strange to fork out $200 million tax payer dollars to "fix" Puget sound while refusing to insist that the protections are honored. What a way to run a State! Take what I say and do what you want. Is there ever a point that you will actually do something about the continued loss of functioning wetlands that used to provide plenty of fresh clean cold water to the salmon or will it forever be this way?

This means that we have yet another non enforceable document to line our shelves with. We already know (and so do you) that none of ECY's criteria are met now, this county claims that OFM & CTED have virtually ordered them to build at a minimum of 4 per no matter what, so they refuse to remove the wetlands from the available buildable land but instead claim the what property's total "could be if there wasn't wetlands on it" and cram them all together on what's left, ending with lots that range between 4500 & 5000 sq ft. That is not 4 per under any stretch of the meaning of the words. Often they allow huge portions of the wetlands to also be destroyed calling it "compensatory mitigation" where the wetlands are actually destroyed then re-built later, resulting in a total loss of function.

You already know this, my question is, why is OFM doing this to our county, and why do you keep releasing manuals and procedures that cannot be implemented or will not be enacted and used and then refuse to see to it's implementation?

From: Tim Trohimovich
Subject: [wagroma] FW: Using the Wetland Rating System in Compensatory Mitigation
To: WETLANDS-INFORMATION@LISTSERV.WA.GOV
Subject: Using the Wetland Rating System in Compensatory Mitigation

Hello,
We have just completed a focus sheet that describes the constraints inherent in the Washington State Wetland Rating Systems when used for estimating changes in functions.

The rating systems for eastern and western Washington were developed to categorize wetlands in the state based on their sensitivity to disturbance, their rarity, the difficulties in replacing them, and a characterization of how well they function. An intermediate step in the categorization requires users

to calculate a numeric score for each of three groups of functions (improving water quality, hydrologic, and habitat). As a result, there is interest in using these intermediate scores to estimate changes in functions that can occur from impacts, restoration or compensatory mitigation. There are, however, several major constraints in trying to use the scores for these purposes. These constraints are described in the focus sheet. I am attaching a pdf file of the sheet and it will also be available in the next few days on our web. Please contact me if you have any questions.

<<Focus Sheet - Using Rating System in Mitigation 3-18-08.pdf>>

Feel free to forward this information to other interested parties.

From: Michael Grady

Date: 04/24/2008

Comment: I'll be attending tomorrow's Water Quality Forum at the Convention Center. I've attached some information for use by the Partnership to help you and David better understand the science and the lack of regulatory control over the pollutants of concern to salmonids.
It is our understanding that you and David will be using this information, and input from stakeholders, to seek regulatory, as well as grass-roots support for making changes in the way we treat, monitor, and enforce water quality that is protective of listed species, and thereby aid in their recovery. We stand ready to help in any way possible...

PS--The SPU study on high-efficiency sweepers is in draft and sounds promising for source control...we will be working with WSDOT/FHWA on their application for the 520 and I-90 bridges, the Viaduct, and ferry terminals--areas where it is difficult to provide treatment...

Attached: Ecotox_Stormwater_FY08
Stormwater_Runoff_and_Puget_Sound_final_6-27-07
NMFS letter tp Partnership--Oct 06
NMFS SW Perf Stds-1
King County Stormwater Program letter-4 March 08
NMFS final comments on Phase I and II-2006
WSDOT-NPDES permit NMFS comments signed March 2008

From: Andrew Marks

PugetSoundPartnership
our sound, our community, our chance

Date: 04/24/2008

Comment: I am unable to attend the Fri. April 25 Water Quality Meeting in Seattle, so please accept this written testimony into the record.

This appends my earlier comments regarding the importance, and significant omission of LID as an important Water Quality strategy for Puget Sound.

Pervious surfaces, particularly pervious concrete surfaces address most if not all of the issues associated with intentional and illicit stormwater runoff and the pollution it carries. There is data to support the statements made herein, much of which will be presented in the papers supporting Curtis Hinman's testimony.

Quantity – Pervious concrete pavements effectively retard, and attenuate first flush and longer duration stormwater runoff events. While concern is often focused on larger, longer return period events, it is the routine short return period events that flush a continuing stream of runoff to surface receiving waters. Pervious concrete surfaces effectively mimic an undeveloped condition, and prevent most if not all runoff resulting from routine Puget Sound area rainfall events.

Quality – Most pollution constituents associated with stormwater runoff pollution are contained in the particulate and settleable solids fraction. Pervious concrete surfaces not only prevent the runoff from occurring, they prevent the velocity of the runoff from reaching scouring rates. This effectively allows the settlable particulate fraction to be left in place at the point where it is generated. Studies show that significant amounts (often exceeding 90%) of heavy metals, COD, BOD, and most other pollution fractions settle out of stormwater, and are trapped in the upper layer of soil (2"-4" depth) beneath the pervious pavement and storage layer. The one fraction that does not show significant reduction through the pervious pavement section is nutrients. Typical nutrient (N, P, K) removals consistently fall in the 40% to 60% range, as those fractions are typically dissolved in nature. While the biological action effect of the pervious pavement layer is not quantified, it is recognized that biological growth and pollution removal associated with that phenomenon exists. While typically not acknowledged, the biological removal mechanisms are an active contributor to water quality of the infiltrate, as well as ultimate runoff in extreme events which would have occurred in an undeveloped condition.

Materials stability – Concrete pavements have been in place in the Puget Sound drainages for up to 100 years. Pervious concrete pavements use the

same technology, and should be expected to exceed a minimum design life of 30 years. Concrete is inert. The materials are not affected by environmental conditions, and do not require overlays or sealcoats in order to serve their useful lives. Concrete materials do not contain carcinogens and do not liberate Polycyclic Aromatic Hydrocarbons into the runoff regime.

Pervious Concrete pavements are already in use in a number of Puget Sound area jurisdictions as stormwater management measures. Those agencies include Seattle, Federal Way, Mukilteo, Bellevue, Pacific, Sumner, Sultan, Snohomish, Lake Sammamish, Olympia, Lacey, Kirkland among others. Major national commercial retailers have recognized the benefit of pervious concrete surfaces and are using or investigating pervious concrete for use. Those include Wal-Mart, Safeway, Target and Costco.

LID, in general, and pervious concrete surfaces in specific as a subset of LID, cannot be ignored or dismissed. Those elements are too simple, too effective and too important to not be prominently included in any water quality initiative going forward.

From: Richard Horner

Date: 04/22/2008

Comment: I want to confirm Tom's assessment of the situation and second his comments. I was disappointed two years ago, annoyed one year ago, and now I'm downright mad. I feel I was used twice and had my time wasted.

From: Gary Minton

Date: 04/22/2008

Comment: A few comments on the document dated April 14

The discussion at the bottom of page 16 on structural BMPs: The use of summations from the International Data Base (Geosyntec and Wright Engineers, Inc., 2007) is unfortunate and without technical merit. Totally inappropriate. For several reasons:

- first, the Data Base does not necessarily contain all appropriate studes;
- it contains many old studies in which the facilities that were evaluated were not designed according to good design criteria.. some were not designed as treatment systems per se .. e.g. testing a small urban lake perceiving it to be a treatment pond
- a total mish mash of design criteria for any given system type

- in some cases the data base has had a facility placed in the wrong group.. e.g. a filter grouped with swirl concentrators - perhaps these have been corrected by now
- if a group of one type of treatment systems generates negative efficiencies.. we should not be parroting the information.. rather.. we should ask the simple question "why is negative removal occurring"

The proper approach is to be selective and judicious in the use of information available in the data base. To condsider the relationship between design criteria and performance for each type of treatment system... and from this information identify the perforance that is likely to occur given the design criteria used in our local manuals.. while also considering that many of our design criteria require updating to more cost effective criteria.. based in part from what one can learn from carefully examining the International Data Base.

As for LID.. the term "limited research" appears perjorative. Implies we have insufficient information to move forward with these design concepts. In point of fact with respect to any topic in stormwater.. no matter the aspect...research is limited.. There is sufficient information to move forward with LID while recognizing that as with any treatment system it has its limitations and that we always need to need to learn more.

Bottom of Page 19 ... "Measured effectiveness of stormwater retrofit approaches that ensure contaminants are effectively removed or contained and not inadvertently transferred to groundwater." What is the author implying? That if groundwater quality is changed than we should not infiltrate stormwater? If so, we should apply the same logic to streams, lakes etc, i.e. we should not discharge to surface waters if that results in changing the water quality of those water bodies. Why is groundwater commonly perceived as untouchable when surface waters are not? It is a simple reality that to protect our surface waters from direct discharge of polluatnts as well as maintenance of summer flows we must infiltrate stormwater. We need to view the entire hydrologic cycle. Our goal is for new developments to mimic as closely as possible the predeveloped hydrologic cycle; our goal with existing development is to retrofit to alter the current hydrologic cycle back towards the predeveloped condition, while taking appropriate measures to minimize the impact on the water quality of both ground and surface waters with equal consideration to both. This strategy necessitates true source control.. e.g. getting copper out of brake pads, stop using exposed galvanized zinc surfaces, no copper downspouts, street and parking lot sweeping, etc. etc.

The groundwater to which you refer eventually reaches the particular surface water.

Information suggests that containinents do reach groundwater aquifers. We have a fair amount of info. Besides, the statement implies that all retrofit strategies involves infiltration which it does not, but if it does, then. why.... then no bioretention, porous pavem

From: Andrew Marks

Date: 04/22/2008

Comment: I had intended to attend the Meeting in Seattle scheduled for April 25, 2008, but am unable to attend due to an illness in my immediate family. Please enter the following comments into the permanent record of testimony on this topic:

I have some observations. I do not know who the author of the Draft Water Quality Topic Forum paper is, there is none identified. The paper does not appear to be a strategy, but rather an inventory of existing conditions and a list of currently known and inventoried methods to address pieces of the inventoried conditions. (The bibliography is 133 items, 9 pages long for a paper, the body of which in only 34 pages) The following statements in the first two pages of the paper are significant:

”The intent of papers is to focus on WHAT the problem is and WHAT solutions are needed, rather than HOW to implement specific solutions.”

“Current strategies: From a topic perspective, have we accurately characterized what we are now doing to address threats? Have we missed any major programs or projects?”

“Strategies to continue, add, or change: Given the status of and threats to the topic, effectiveness of the tools available, and current strategies to address threats, have we accurately captured the strategies we should continue, add or change? Have we missed any strategies and actions we should continue, add or change to address the threats (not just good ideas)? What sources have informed your thinking?”

Low Impact Development, (LID) clearly has been given short shrift in the paper as written. While that is perhaps not surprising given the recent emergence of LID and its predictable absence from existing literature, it is a significant omission of a likewise significant strategy.

"Have we missed any major programs or topics?" The answer is an unequivocal Yes. "Have we missed any strategies…?" Again, an unequivocal Yes.

If I could assert one point – The issues facing us in addressing the recovery of Puget Sound are unprecedented in the region, maybe even in the US or the world, and will require methods also unprecedented, which, by definition, means that many of those methods are not yet identified or invented. LID has been shown to be effective, but the definition of LID changes rapidly as do the methods employed to implement LID. While we do know that LID is effective, and can be more effective, we are unable to fully quantify all the LID methods and materials available, and more importantly, the results of these methods and materials due to the short lifespan of their use in this region. This fact is illustrated by the fact that the LID Technical Guidance manual dated 2005 is now significantly out of date, and is scheduled for rewrite and updating this year, 2008.

We know that LID methods can be effective, and we also know that the barriers to greater use and implementation are human, and related to the same existing regulations and methods that exist today, to be included in the inventory today. Again, by definition, the fact that current strategies are current - the existing methods and regulations that are in use today - more likely speaks to their ineffectiveness to preclude or prohibit the damage that has been done to date. If change is to be made in the short time frame identified, new strategies, such as LID, must be employed, if for no other reason than LID is effective and can be implemented immediately, with little or no direct cost to the Partnership, or to the State.

The Puget Sound Partnership has the incentive, the means, the ability and the need to push LID to the forefront of the strategies to effect the recovery of Puget Sound. We know that pollution rides into the Sound in stormwater. We know that when stormwater is eliminated or reduced, the pollution it carries to the Sound is also eliminated. LID effectively addresses stormwater and stormwater pollution, both in combined sewer overflows, and in stormwater discharges alone

As an engineer and scientist, I cannot stress strenuously enough the importance of not only the inclusion of LID as a key element of the PSP strategies, but the identification of LID as THE KEY strategy in the reduction of existing and new stormwater-related sources of pollution into Puget Sound going forward. LID will in all likelihood be a key strategy in retrofit, remediation and rehabilitation of existing conditions to remove

existing stormwater discharges from the Sound.

To reiterate, LID is likely the most cost-effective solution and the most efficacious strategy at PSP's disposal to cause real immediate change in factors affecting the deterioration of water quality in Puget Sound. LID must be emphasized as a key strategy for immediate implementation to effect immediate and long term improvement in the recovery of Puget Sound. LID is already recognized among stormwater professionals, and PSP can effectively tap an existing and growing resource among private entities and public agencies through Low Impact Development (LID) methods and practices. It is simply beyond consideration that this strategy not be employed in a high profile and significant manner as a key element of the Puget Sound Partnership's Water Quality element.

From: Peter Beaulieu

Date: 04/22/2008

Comment: Attached are my responses to your five papers.

The papers are a delight to read, and trigger for me many lessons from earlier years that might have useful application in the years ahead. Thank you for the transparency of your approach. (I will be at the Regional Council's annual meeting Thursday to hear Bill Ruckelshaus' remarks.)

The following suggestions are somewhat of a patchwork rather than comprehensive, and do not duplicate points already made in the Partnership's five initial draft topic papers. They consist mostly of one retiree's reminiscences (!) of specific examples possibly helpful to the Partnership in its new work, and hopefully carry forward the dedicated work of many who have come before. (The Partnership is to be specifically commended in its enabling statute and personnel connections for building directly on the sustained efforts of the Puget Sound Action Team.)

Overall, the content of the Partnership's draft papers, their content and tone, and the reader friendly structure for response are all to be most highly commended. This is good work, and even a pleasure to read.

Thank you for this early opportunity to contribute.

THE BASELINE PROBLEM STATEMENT

Find opportunities to tie pollutants to large scale or widespread chosen

practices, when this is more instructive than a less direct tie to demographics. (The governing state statute is the Growth Management Act of 1991, which mandates "management" rather than an abstract ceiling.)

Examples:

• The Water Quality paper reports that in recent years polynucleated aromatic hydrocarbons (PAHs) have increased. PAH deposition rates dropped precipitously in the 1950s as coal burning was replaced with other home heating systems. The recent increase (still far below historic levels?) must be presented in this larger context, and then traced to correctible sources.

• As a second example, the Interstate 405 Corridor Program and the earlier I-90 bridge crossing claim a net decrease in runoff even as transportation capacity is increased. This outcome is due to design improvements such as culvert improvements for both old and new facilities (case study for retrofit discussion, pp. 16, 29). The cleanup burden must not be placed fully on the incremental increase in Sound area activity (a case study is the rate structure attached to the Brightwater Wastewater Treatment Plant proposal in King/Snohomish County. A balance was attempted between the financing of new treatment capacity and stormwater runoff.).

What is the more researched and current timeline information for various deposition rates (not only levels in the water column)? In 1983 the deposition rates for Puget Sound as a whole (not for localized sites) for several contaminants were reported to have declined in recent years.

Examples (affects p. 32):

• hydrocarbons reduced by 50 percent since 1950,
• Chlorinated compounds by 30 to 50 percent since 1960,
• Mercury by 20 percent since 1960 (The Habitat – Species Diversity paper reports that airborne mercury is on the rise due to emissions in Asia, p. 5),
• Arsenic by 15 percent since 1960 (Tacoma Asarco Plant closure);
• Lead by 10 percent since 1960.
• Holding constant in 1983 were silver, copper, cadmium.

STRATEGY: OVERALL

Further develop the insight that optimum ecological restoration is not the same as homogeneous protection at all geographic scales. That is to say, it is a smart move to protect the most valuable and vulnerable areas (equivalent

examples: Mountain to Sound Greenway, rainforest preserves established in the Amazon rainforests, and even National Parks).

Puget Sound examples (finer grained, but from within our urban region):

• The approach used for offsite mitigation in the Cross-Base Highway Corridor Program might offer a kind of template. The documented strategy included identification of redundant candidate project areas offsite (each with unknown availability), and for each investigates public and private long-term management options, etc.

• The incorporation of an Environmental Program into the Record of Decision for the I-405 Corridor Program (making such actions obligatory), and which selects (with directly involved water resource agencies) cost-effective mitigation sites for runoff volumes from within entire sub-basins of the WRIAs, rather than only from within the project corridor. (The transportation Corridor and sub-basin maps – in the Green and Cedar WRIAs -- are superimposed. In its complexity and size – 240 square miles – the I-405 Corridor is conceptually equivalent to a WRIA plan. The transportation and WRIA fiefdoms worked together.)

• Supporting the proposal for protection of pristine areas (Water Quality paper), is the example of Seattle Water Department consolidation of Cedar River Watershed ownership. This was done over two decades of trading property inholdings for acreage at other locations in the Cascades (and as originally proposed in the 1983 Comprehensive Water Supply Plan, another good model of complex resource management.)

• On the two-way relationship between water resources and land use, notice that the Snohomish Valley is protected by the urban growth boundary, while the earlier Green River Valley is not. Much of the difference turns on a seemingly technical detail, the fact that under federal guidelines urban development in the flood plane counted as a project benefit in the 1950s (hence the Kent-Auburn warehouse and Boeing complex), but not for any proposed dam on the Snohomish tributaries as under the Snohomish Basin Mediated Agreement (hence dairies and cattle pads).

STRATEGY: GEOGRAPHIC FRAMEWORK

Thinking backwards from implementation options to the way we frame the Puget Sound problem statement at the start, how might we begin early to cross-connect problem formulations to real implementation options? How can we think right-brained about the total package?

• Without muddling the more linear and legitimate Partnership approach, develop flexible technical capabilities, i.e., provide a standardized GIS capacity, a shared ecosystem map overlay system displaying (a) the Puget Sound Basin, (b) the Water Resource Inventory Areas (WRIA) boundaries and plans, and where available (c) 1960, 2000 and 2040 data sets (e.g., now available Puget Sound Regional Council maps), etc.

• For each sub-basin; the Geographic Information System (GIS) capability must be transparent to GIS for Water Resource Inventory Areas (WRIAS), to local land use GIS as well as habitat GIS (which is already proposed in the Habitat paper, P.20), and to stormwater (Water Quality, p. 30).

• The logic of realistic and effective implementation requires that the Sound be treated equally as a basin unit and as a collage of sub-basins, rather than as a unity nuanced only a bit with local detail. Specifically, priorities and an action agenda must be decisively developed in two distinct categories: overall, and sub-basin with some shared elements. The layered look is in. For example, and affecting both categories, what do we know about tidal circulation patterns and basin and sub-basin flushing cycle?

• The purpose for GIS compatibility and transparency is twofold: technical analysis and integration as already proposed, but also layered visibility of interrelated issues for the direct attention policy boards otherwise confined to their fragmented agency mandates and “radar scopes”. An excellent display would be a view of future land uses, showing those small sub-basins where future growth will violate the general thresholds of more than 12 percent impervious surface, or less than 65 percent forest cover (p. 8).

• This reader believes that the regional agenda must consist mostly of a fabric of sub-regional actions. GIS transparency is encouraged, for example, to help ensure integration of land use and water resources planning (p. 31), however this technical tool must not take on a life of its own, obscuring critical caution contained in the Water Quality text, namely, that pollutant runoff is highly variable within land use classifications (p. 7). A focus on gusty and clear performance measures is probably more consistent with the state Growth Management Act and more to the point than a population lid as seems to be implied in the Habitat paper (pp. 63, 65).

More rumination:

• Develop a map strategy. Replace or greatly supplement the King County pre- and post-1990 Map in two ways (Water Quality paper). The suggestion

here is to move in the same direction, but in a more informative and comprehensive way. Why only King County, and why pre- and post- 1990? First, use the Puget Sound Regional Council maps for the four-county sub-region for 1960, 2000 and 2040, supplementing these as possible for the remainder of the Puget Sound basin. Second, superimpose the pre- and post-map onto the mosaic of WRIA basins. A technically consistent and shared map strategy might or might not imply a centralized control of maps and information (as is proposed in the Habitat paper).

• Superimpose the Conservation Trust Map (Habitat paper) onto a mosaic of WRIA maps and onto a jurisdictional map. This will give a better look at natural systems and at local government implementation aspects.

• Systematize the maps. We are challenged by the fact that Puget Sound basin activities were superimposed on a standard composite of WRIA boundaries (not yet labeled as such) in all of the topical volumes of the federal/state mult-agency Puget Sound and Adjacent Water Study (PSAWS), completed in 1971 and in the days prior to GIS(!). With this basinwide context, additional WRIA level maps can then be lifted out for sub-basin attention without fragmenting the unified effort. This split-level approach has been done before.

• Marine mapping. Show what we can about Puget Sound tidal behavior and sedimentation issues. A very preliminary effort is provided by the 1983 Puget Sound Water Quality Conference (see footnote 3, Proceedings, above). Of ten outgoing tidal units heading north from Seattle, seven reverse with the next tide to return from a point south of Port Townsend, with six of these then continuing so far south as to mostly encircle Vashon Island clockwise (four units), or to move south even through the Tacoma Narrows (two units). Supports Water Quality paper, p. 33).

WATER QUALITY PAPER

What is the broad institutional context for engineering solutions to water quality issues?

Factors and considerations:

• Realistically, Puget Sound cleanup will compete for funding at the federal level with nuclear waste cleanup, but we might also look for possible parallels between Puget Sound cleanup and Hanford cleanup. Two significant differences at Hanford are the exclusive federal causation and responsibility, and the statutory existence of a federal cleanup program.

• What are the possible merits, if any, of reducing contaminant discharges through a "bubble concept" involving marketed offsets, as is done with air quality emissions? Related to this is the Hazardous Waste Exchange set up in King County some years ago, and which might still exist (I am out of touch.)

• Regarding wastewater treatment plants, a diligent look is needed at the relative merits of upstream source removal as compared to tertiary treatment. This is noted in the papers and should be pursued. A case in point is the reported increase in pharmaceuticals in the marine environment. How much of this is due to the required in-home garbage disposal of surplus drugs under the protocols of the growing home hospice programs?

• Priorities repeated from the Human Health paper: (1) Prevention or response to Red Tide seems to be understated as an ongoing urgency and priority. Red Tide is both sporadic and sometimes fatal to humans, and hard to police. The importance of agile response capabilities to issues such as this, alongside long-term management and engineering efforts, is obvious and should not be lost between comprehensive report covers. (2) Another high overall priorities is clearly the need for more information and precautionary action related to the recycling of possibly life-threatening (fetal) wastewater pollutants through the marine environment and back into the maternal human food chain (pp. 10, 25, 30). Thinking multi-media (water, and air), it appears that we may have a parallel to "secondary smoke." (3) And, given the difficulty of tracing pollutants to sources, and given the direct effects of marine recreation on endangered embayments with low circulation (p. 12), a regional policy fostering a myriad of local corrective actions is imperative.

From: Tom Holz

Date: 04/21/2008

Comment: Bruce

Thanks for forwarding comments on the Water Quality issue paper to Martha Neumann.

I have been getting feedback on the Water Quality paper from discouraged folks. To them it is like ground hog day. Every day (so it seems) we have to start from absolute zero and build a case for a real action plan. So it was in May 2006 at the UW forum, then again in October 2006 at the Mountaineers building, and when that didn't work, the letter from "the 14" was sent. We

started from scratch again at the workshop at Mercer Island (the guy next to me said "the most frustrating meeting he had ever been to"). It seemed like we were making progress with the early action paper that Ritchie and Horner and others drafted. Now we are at zero again with another request for references and research to support a plan to steer us away from the disaster for Puget Sound that is already underway and in late stages.

The feedback I am getting is that no amount of references or white papers or testimony is going to change the "corporate culture" that seems to permeate PSP. Like I say, there is real cynicism out there. I hope that PSP will show us that our cynicism is baseless.

From: Tom Holz

Date: 04/20/2008

Comment: Bruce

I have just received the draft discussion paper on "Water Quality" issues for the second forum (attached).

Even though the document is described as a draft, it is disturbing. It frames the stormwater problem with hardly a reference to work done by May / Horner / Booth / Karr. It does not mention B-IBI as a method for monitoring receiving waters nor does it comment on the limitations of water chemistry as a means to characterize water quality. It does not mention the role of forest removal in water quality impacts. It seems to lean entirely on Nature Conservancy and land trusts to preserve watersheds. It is dismissive of low impact development as a management technique (to quote: "limited research has been conducted on the effectiveness of low impact development techniques to improve water quality"). Tools and management techniques described for stormwater lean exclusively on NPDES end-of-pipe nostrums. This paper leaves forum attendants with the burden (for the third time) of totally shifting the direction of the discussion back to reality.

I am hoping that this paper was written by someone who has been on sabbatical since 2006 and was given this assignment without a briefing on work completed since then. Can you fill us in?

From: Peter Beaulieu

Date: 04/20/2008

Comment: Dear Martha:

At either the May 1 or May 5 (2008) Workshop I will hand deliver to you three short and early documents related to my memorandum of April 22, 2008 sent by e-mail. Two of these papers relate to ESSB 5372 Section 8:3 which calls for a delineation of "action areas" based in part "upon the characteristics of the Sound's physical structure." The papers support needed action area boundary refinements for saline Puget Sound.

Respectively, the documents (1) show at least crudely the tidal circulation patterns of Puget Sound as a whole, (2) differentiate between Sound waters as a whole and two principle and localized problems of toxic hotspots and bacterial pollution from non-point sources, and (3) segment the presumed Puget Sound unit into distinct reaches divided by seafloor sills. More recent research must be available from the Department of Oceanography or from the former Puget Sound Water Quality Authority (1983-1990).

(1) Schematic of a water parcel's path in the Central Basin of Puget Sound, from Dr. Robert Stewart, NOAA and Institute of Marine Studies, University of Washington, in Proceedings, Puget Sound Water Quality Conference, Puget Sound Regional Council, 1983, pp. 108, 109 (bi-national with 4-500 participants, and co-sponsored by 26 public and private institutions).

(2) "Large Scale Mass Fluxes in Puget Sound: Implications for Water Quality Management", Robert Stewart (Institute for Marine Studies), with Curtis Ebbesmeyer, Pieter Booth and Edward Cokelet (NOAA), c. 1984 (Appendix figures 3a – Geographic Definition of Advective Reaches, and 3b – Plan-View Schematic Diagram of Puget Sound Mass Transport Model, and separate depiction of reaches and connecting mixing zones).

(3) Testimony to Puget Sound Water Quality Authority, c. 1986, by Alyn Duxbury, Institute of Marine Studies, University of Washington, profiling Puget Sound and pollutant behavior within the ecosystem(s), e.g., residence time of water in Puget Sound is 150 days, and particulate residence time within the Sound is a lesser ten days average (before settling).

I will also include (4) a short paper touching on the Lake Washington "cleanup" as significantly aided by serendipity bio-manipulation as part of adaptive management: "The Great Lake Washington Detective Story," Feb. 15, 1989, Peter D. Beaulieu, based on and edited by Dr. W.T. Edmondson (School of Zoology, University of Washington). Among other lessons, this case specific evidence and illustration of bio-manipulation points up the difficulty of measuring whether, in an eco-system niche such as Puget Sound, one's actions are having a demonstrable cause-and-effect

relationship to desired outcomes. Apart from direct effects in limited geographic areas such as embayments and beaches contaminated by adjacent runoff, when are deliberate Puget Sound actions incidentally to other larger but more remote species altering events such as Pacific Ocean temperature changes, predation, etc.

My general message is threefold:

First, the Action Agenda should include as an essential "action" a commitment for ongoing dialogue between policy and science (still retaining a clear distinction between scientific risk assessment and policy-setting risk management) as a necessary ingredient for a sustained effort to ensure a sustainable Puget Sound. Can the Partnership remain "problem solving rather than project driven" – a motto of the transportation bureaucracies during some of their more lucid moments (as in the instructive I-405 Corridor Program.)

Second (therefore), the Action Agenda should be a "rolling plan," fostered in ongoing partnership with the multiple co-sponsoring lead agencies, and producing separable "action packages" -- serving each of the reach-and-sill (above) delineations (saline Action Areas) as also aligned in those cases when local issues are widespread. Let us not confuse means and ends -- I submit that the Action Agenda is a means, and that the end is formalized and ongoing mutual engagement by lead agencies (structured "forums" or caucuses, perhaps statutorily required) on clear and actionable problems.

Third, rather than immobilizing itself too much in open ended regulatory reform, the Partnership should daily maintain as the coherence-giving frame of reference the Puget Sound ecosystem(s). With this context diligently protected from the fragmenting alliance of specialized professionals and unwitting bill writers, the Partnership might then, very strategically, foster greater ecosystem coherence at the accessible state and local levels and, by this example and by day-to-day communication, also challenge members of federal agencies and Congress to do the same (e.g., what about expansive flood plane insurance, the Corp of Engineers mindset toward vegetation removal, and endangered species protection as a sometimes a barrier to broader ecosystem management?).

In all of this, note the key word members…in order to have any chance at all of penetrating the bastions of bureaucracy (government, science, industry, even citizen groups), communication MUST be sustained and between and among human faces, not word processors and letterheads.

PugetSoundPartnership
our sound, our community, our chance

From: Donna Beltz

Date: 04/19/2008

Comment: To whom it may concern,

I am a builder coming into the State of Washington. I am always looking for good ideas to bring into my projects that promote a more efficient and greener build. We have been planing our move to Washington but really didn't want to be on a septic system. We have been following the research and development of one particular company that really out shines the rest and offers an ingenious solution to a serious issue that is nationwide.

http://www.xerolet.com

This product is one we are
willing to bring into our own home as a beta tester to promote a greener product to the environment as our first build in Washington.

We are finding that there are no rules preventing this, but there are no rules allowing it and everyone is hesitant to make the initial move. We are being told that there is no funding available to initiate the PDA program that can allow us to move forward with this.

The product has been approved in the state of Florida and the State of Hawaii. It is an amazing concept that will promote growth management, reduce household water usage and replace septic systems entirely.

We are absolutely in support of this project and are willing to do whatever we need to promote it, do you have any ideas or advice you can give us to help achieve this goal.

We believe the value of this product speaks for itself and the founder of this product is a phenomenal person who exceeds in the health, safety and well being of the public welfare.

From: Lisa Palazzi

Date: 04/15/2008

Comment: Hello Millie Judge,

I am linking to you from the online PSP Habitat and Land Use topic forum information system. I have emailed the PSP before, but have not yet heard

anything back – other than being put on these email lists. I love getting this information, and will be involved with the process. But I have a parallel process going on that I need the PSP to know about.

I have been working within a larger group of soil and wetland scientists (main contacts listed above) over the past several years at the state legislature, trying to get a state certification program going for these two key professional scientist groups (more information at www.soilscientistlicensing.com). We need some help from a group like PSP which has direct interest in the exact issue that this legislation is intended to address – protecting and restoring the Puget Sound ecosystem – in particular water quality, water quantity and related water dependent wildlife habitat.

We have been through Sunrise Review process (http://www.dol.wa.gov/about/reports/sunriseSoilScientist0108.pdf) – results from that extensive report recommended certification. And that means that there is documented evidence that unprofessional or unethical work carried out by those two professions has had negative impacts on public health, safety or welfare in WA state. So this is a real problem. We need to ensure that the people carrying out this work are adequately trained and educated, and that there is a state-based complaint system in place to ensure that bad practitioners can be removed from the certified professional list.

Soil scientist's and wetland scientist's work has direct impacts on water quality and water quantity balances in the Puget Sound. I am a consulting soil scientist (focus in hydrology) and wetland scientist, and I work on over 100 relatively small soil/wetland projects per year (individual landowners or subdivisions). And I have a small company (www.pacificrimsoilandwater.com). So the potential cumulative effects of our entire professional group are obvious and enormous. We expect to have about 300-400 certified soil or wetland professionals state-wide, with more than half working in the Puget Sound basin. At that rate – there could be (most likely are) over 15,000 relatively small soil or wetland projects per year in the Puget Sound basin that directly affect wetlands, and soil erosion, and water quality, and water quantity. That estimate ignores the larger projects that we work on – highways; ports; airports….. This is important!!

Unfortunately, the legislature does not respond to logic or facts, but rather to politics and powerful interest groups. And we – being a rather small group of scientists – do not meet that criteria, and are not that effective at the political process. Logic and facts are on our side (Sunrise Review), but the Engineering and Architects (AELC) and other consultant (NEBC) lobbying

groups are not; neither are the forestry lobbyists (WFPA, WFFF). The AELC simply doesn't want any more professional licensing or certification programs run by the state—turf issues; the foresters and NEBC are afraid the new program will mean that they will be required to hire those professionals when they do soils or wetland work – another layer of bureaucracy; and other smaller lobbying groups are simply following the lead of their more powerful peers. And for those reasons alone—nothing to do with logic, or the fact that this program is very much needed -- we may not get this legislation passed. We are working with these lobbyists, trying to change their stance. But they are simply not that interested in us, because we have so little power.

But I know that if we have groups like the PSP behind us, we will not fail. So --- I am contacting you. I hope that you will pass this along to your peers in PSP, and can get back to us with some indication of whether or not you can help us at some level. I know that PSP is not a lobbying group; but I also know that you have contacts and power that we do not.

From: Linus Heydon

Date: 04/14/2008

Comment: THE TECHNOLOGY TO HELP SOLVE THESE PROBLEMS ALREADY EXISTS:
• The use of Managed Artificial Marshes to clean domestic, industrial and landfill waste-waters has been proven and in use in Europe since the 1960's. Verification research for the U.S.A. was done at Santee in San Diego County, California 1980-85. These tests, conducted by the San Diego Region Water Reclamation Agency, proved the system's ability to remove nutrients, kill pathogens and immobilize toxics.

(Mr. Heydon participated in this 4 year study and has since continued research and application.) Many publications provide information on the techniques as they are developing and being refined. Refer to all publications listed in Bibliography]]

REFERENCES IN SUPPORT OF THE ABOVE STATEMENT

These references are representative of many papers published in Europe and the U.S.A. on the subject of using artificial/controlled marshes to clean contaminated water and sewage.

K. Seidel seems to have started the research in Europe as early as 1965. Her

student, Reinhold Kickuth continued the research, became the chairman of Ecological Chemistry in the Department of International Agriculture, for the University of Kassel, located in Witzenhausen, Germany. Many Kickuth students have continued the work. R. Kickuth was responsible for popularizing the use of constructed marshes to clean water, in Europe.

S. Reed has been a prime mover in the U.S.A., gathering and publishing the results of research done in the U.S.A.

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There has been a great deal of work in this area, however:
1) None of the work so far has tested the ability of this system to retro-strip nutrients already in a lake or reservoir. Personal experience with the system, and the data from publications, indicates a high degree of probability that this experiment will verify the viability of this much needed tool.
2) There is considerable room for improvement. "Although experimental work has been underway for more than 30 years the technology is still in its infancy and much remains to be learned on design, construction and operation." (pg. 79 Hammer 1992)

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C. SUMMARY of Research that is Already in Place,
Most Recent Advances Made In This Area of Work, and How This Proposed Work Will Contribute.

Research described in the publications listed above (particularly those in bold type) ---has verified in Europe and the United States that artificial controlled marshes can be designed to meet specific cleansing requirements, including the removal of biochemical oxygen demand (BOD), nitrates, phosphates, and ammonia (Seidel & Kickuth 70) (Gersberg). These marshes will also kill pathogenic organisms (bacteria and viruses) (Gersberg 86) and immobilize a variety of toxins and heavy metals.(Kadelec & Knight 95 Chap 15-16) Significant numbers of functioning systems have successfully accomplished stand alone tertiary-level cleansing of domestic waste water and the reclamation of many different types of industrially contaminated water, the seepage from ore mines, toxic waste and domestic waste dumps (Moshiri 93) (Hammer 89). Domestic and foreign conferences for aquatic scientists and waste-water engineers gradually are winning converts to start using this low-tech approach to cleaning contaminated waters (Cooper 90) (Hammer 92) (Heydon 92) (Wengrazynek 93). Most recent advances have been collected hard bound publications of previous research and centralized data bases for cross-checking of system effectiveness - unfortunately these

remain within the technical / educational community. Recent work in Maine has started a trickle of information on the practical application of combined technology of silt AND nutrient removal as applied to pasture and row-crop situations, but it is so far limited to the northeastern climate of U.S.A. (U,S,D,A, 1991) (Hammer 92) (Higgins 93)

A thorough review of a significant body of the available literature is enough to convince the most skeptical, but open minded student, that although this is an infant technology, there is more than enough evidence to press forward with all possible speed, using this innovative approach to technology transfer.

Attached: R.S.S. DIAGRAMS.zip