

**Declaration of
Joseph Brasher**

AR 012668

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POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION,

Appellant,

v.

DEPARTMENT OF ECOLOGY and
THE PORT OF SEATTLE,

Respondents.

No. PCHB 01-133

DECLARATION OF JOSEPH BRASCHER

Joseph Brascher declares as follows:

1. I am over the age of eighteen, have personal knowledge of the facts set forth in this declaration and would be competent to testify to them if necessary.
2. I have a broad range of experience with surface and groundwater modeling as well as to software development and database design using a number of different hydrologic software packages and programming languages. My experience with hydrologic modeling software packages includes HSPF, SWMM, GENSCN, HEC-RAS, HYDRA, WATERWORKS, HYDRAIN, HY8, and MODFLOW. I joined Aqua Terra Consultants in 1993, where I have been involved in the application of computer models and the development of software applications for the past eight years, with a particular emphasis on hydrologic modeling. A copy of my curriculum vitae is attached to this declaration as Exhibit A.

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ORIGINAL

1 3. Aqua Terra Consultants (“Aqua Terra”) acted as a subconsultant to Parametrix, Inc.
2 in conjunction with the preparation of the Low Flow Analysis Flow Impact Offset Facility Proposal
3 (“Low Flow Analysis”) prepared by Parametrix, Inc. and submitted to the Washington State
4 Department of Ecology in July 2001. Aqua Terra Consultants is an environmental consulting firm
5 comprised of scientists and engineers with a broad range of expertise and experience with
6 characterization of environmental systems, ranging from water quality modeling at the watershed
7 scale to analysis of regional and site specific stormwater detention facilities. Aqua Terra has worked
8 on a broad variety of projects requiring skills in research and application of state of the art approaches
9 to environmental assessment. In addition to expertise in hydrology, hydrogeology, chemistry,
10 biology, ecology and geologic sciences, Aqua Terra has extensive experience in computer
11 programming, data management, and model development and application.

12 4. Aqua Terra was assigned the task of modeling the surface water flows and impacts
13 associated with the construction of improvements called for in the Port of Seattle’s Master Plan
14 Update in Miller and Walker Creeks. Parametrix performed the modeling for Des Moines Creek in
15 consultation with other subconsultants. The model used by Aqua Terra to perform this modeling
16 was the Hydrologic Simulation Program – Fortran (“HSPF”) model.

17 5. The HSPF model was one of the most important tools used to determine existing and
18 future hydrologic conditions at STIA. It was also critical to identifying how those conditions will
19 change as result of the construction of the Port’s Master Plan Update (“MPU”) projects. The HSPF
20 model allows continuous simulation of stormwater runoff at STIA, as STIA is currently configured,
21 and as it will be configured when the MPU projects are complete. The model is appropriate for
22 western Washington, where stream flow is dominated by runoff from sequential storms rather than
23 single, large storms. This modeling method is recommended by local agencies for modeling large
24 drainage areas and evaluating runoff impacts on stream systems.

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1 6. Both the EPA and the US Geological Survey use HSPF for their continuous
2 hydrologic simulations throughout the United States. Aqua Terra Consultants wrote the HSPF
3 model and continues to add features and release new versions of the model in consultation with EPA
4 and USGS, as part of Aqua Terra's ongoing contracts with those agencies.

5 7. The modeling that was done for the Port's project was done using the most current,
6 publicly available version of the HSPF model.

7 8. The Department of Ecology has recently contracted with Aqua Terra Consultants to
8 write a model called the WWHM (the Western Washington Hydrology Model) which will be
9 required to be used in conjunction with Ecology's 2001 draft manual on development used for the
10 sizing of detention ponds located in western Washington. The WWHM model is based on the HSPF
11 model, with a user interface allowing use of the model by engineers doing development.

12 9. I have been working with the HSPF model for 9 years. In my opinion, HSPF is the
13 best model currently available for representing the complete hydrologic cycle. When properly
14 calibrated, the HSPF model provides the most accurate results of any model currently available.

15 10. Subsequent to the submission of the Low Flow Analysis, the Department of Ecology
16 issued its §401 Certification for the Master Plan Update project. As part of the conditions of
17 Ecology's §401 Certification, Ecology has requested additional information prior to final design of
18 the low flow facilities that will be provided in the form of an updated Low Flow Analysis. The
19 updated Low Flow Analysis will contain the following:

- 20 • Additional detail on design elements of the reserve vaults;
21 • Additional model calibration;
22 • Modified approach to collecting reserve stormwater for the Walker Creek vault;
23 • Additional monitoring requirements, including infiltration testing and biological monitoring;
24 • Revised drawings showing the modified storage vaults;
25 • Additional detail as required in the §401 Certification.

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1 11. The HSPF Modeling that will be included in the final version of the Low Flow
2 Analysis will be peer reviewed and endorsed by Norman Crawford, the hydraulic engineer who
3 actually developed the model itself.

4 12. It is my understanding that some of the experts employed by the Airport
5 Communities Coalition have asserted that the impacts on the flows of Miller Creek, Des Moines
6 Creek and Walker Creek arising from the construction of the Master Plan Update improvements
7 have been underestimated by the Port and its consultants. This assertion is incorrect.

8 13. In my opinion, based on the data that was available, the HSPF model used to estimate
9 the impacts of the MPU improvements was appropriately calibrated. It is also my opinion that the
10 results produced by the model constitute an accurate representation of the hydrology within the
11 Miller and Walker Creek watersheds, as well as an accurate assessment of the impacts on the flows
12 of Miller Creek, Des Moines Creek and Walker Creek arising from the Port's construction of the
13 Master Plan Update improvements.

14 14. The model was appropriately calibrated. One of the means of calibration was a mass
15 balance calibration. A mass balance calibration attempts to account for every drop of precipitation
16 that has fallen within the watershed being considered. The precipitation gets divided up into the
17 following categories: (1) evapotranspiration; (2) surface runoff; (3) interflow; (4) groundwater; and
18 (5) deep groundwater. A mass balance calibration attempts to track the total hydrologic cycle in
19 order to make sure that the model accurately reflects that cycle as it exists within the particular
20 watershed for which calibration is being done.

21 15. The purpose of this mass balance calibration is to measure the observed stream flow
22 volume at a gage in the watershed and assure that the model accurately computes the stream flow
23 volume of water within the watershed at that gage.

24 16. This mass balance was undertaken using known amounts of water in each of the three
25 watersheds (Miller, Des Moines and Walker). I understand that one of the ACC's reviewers has
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suggested that calibration should have been done using only the gage located in the upper basin of these watersheds. However, if this approach had been used, the model would have been out of calibration, would have assumed more water in system than there really is, and would have actually underestimated low flow impacts. For instance, at Walker Creek, King County has stated that the upper gage in this watershed is less accurate than the gage downstream within that basin.

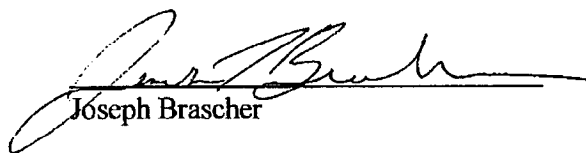
17. The results produced by the HSPF model calibrate very well with the lower basin gauges, which were considered more accurate because they are were more consistent with the mass balance calibration.

18. The steps taken to calibrate the HSPF model for use in estimating low flows in Miller, Walker and Des Moines Creek are outlined in Volume 3 of the Technical Appendices to the Stormwater Management Plan submitted by Parametrix.

19. It is my opinion that the HSPF modeling done to estimate the impacts of the construction of the MPU improvements at STIA constitutes an accurate representation of the impacts of that construction on the flows of Miller Creek, Des Moines Creek and Walker Creek.

I declare under penalty of perjury that the foregoing is true and correct.

Executed at Olympia, Washington this 28th day of September, 2001.


Joseph Brascher

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AR 012674

JOSEPH T. BRASCHER
Hydrologist
AQUA TERRA Consultants
Olympia, WA

EXPERTISE

Hydrology
Surface Water Modeling
Computer Programming
Web Development

EXPERIENCE

Mr. Brascher has a broad range of experience from surface and groundwater modeling to software development and database design using a number of different hydrologic software packages and programming languages. His experience with hydrologic modeling software packages includes HSPF, SWMM, GENSCN, HEC-RAS, HYDRA, WATERWORKS, HYDRAIN, HY8, and MODFLOW. Mr. Brascher also has a thorough understanding of the following software languages: Visual Basic, SQL, C++, Java, HTML, Cold Fusion and Access VBA among others. In 1993 Mr. Brascher joined AQUA TERRA Consultants, where he has been involved in the application of computer models and the development of software applications to provide services to a wide range of clients.

PROFESSIONAL DATA

The Evergreen State College - BS, Physics and Computer Science

REPRESENTATIVE ASSIGNMENTS

Tambark Creek GENSCN Modeling Study, Snohomish County, WA - Mr. Brascher constructed both an EPA SWMM surface and backwater model and an HSPF version 12 model for the Tambark Creek watershed for the Mill Creek Urban Growth Area Overlay Plan. The models were then connected together using a software package GENSCN, originally developed by AQUA TERRA Consultants for the U.S.G.S. Detailed analysis of surface and groundwater was used to determine impacts of future development and changes in zoning.

North Creek Flood Hazard Management Plan, Snohomish County, WA – Mr. Brascher reviewed and updated existing HSPF model of watershed. He evaluated future land use impacts on flood frequency and proposed structural and non-structural solutions to minimize future flood hazards.

HSPF Model of the French Creek Watershed, Snohomish County, WA - Mr. Brascher calibrated an HSPF version 11 model for the French Creek watershed. Identified drainage problem areas and the impacts of future development. This required the implementation of all relevant stormwater regulations and ordinances.

HSPF Model of the Lake Stevens Watershed, Snohomish County, WA - Mr. Brascher calibrated an HSPF version 11 model for the Lake Stevens watershed area. Identified problem areas and the impacts of future development.

GENSCN Development, U.S.G.S., Reston, VA - Mr. Brascher assisted in the development and implementation of the software package GENSCN 1.1. This package is written in Visual Basic and designed to work with several different database formats as well as GIS .SHP files for full data integration. GENSCN also allows data transfer between many different computer models. GENSCN uses a data-grid and a graphing grid developed by AQUA TERRA Consultants as well as several .DLLs developed for data transfer with the WDM database management package.

Snohomish County VIDS - Mr. Brascher customized the VIDS software to meet the needs of the Snohomish County Surface Water Management. This incorporated county-wide mapping and data access to all previously complete computer modeling work.

Hydrologic Model Data Maintenance and Management, King County, WA - Mr. Brascher reviewed, modified, and upgraded King County's HSPF models and hydrometeorologic data for Soos Creek, Bear Creek, East Lake Sammamish tributaries, Issaquah Creek, and Cedar River tributaries. He created a Visual Basic interactive data system (VIDS) to provide King County SWM staff with easy and convenient access to the HSPF models and model results. VIDS allows the user to access maps, HSPF input files and parameter value tables, and model results for each watershed. VIDS is a Windows interactive program that is simple and easy to use; it requires no knowledge of HSPF or programming.

King County Data Management, King County, WA - Mr. Brascher designed and implemented two Visual Basic application and one ACCESS application which when working together allow instant conversion and Web posting of all newly collected hydrometeorologic data.

HSPF Model of the Des Moines Creek Watershed, King County, WA - Mr. Brascher calibrated an HSPF version 11 model for the French Creek watershed. Evaluated the impacts of runoff from SeaTac Airport on current and future streamflows.

HSPF Model of the Miller Creek Watershed, King County, WA - Mr. Brascher converted an HSPF Version 10 model to HSPF Version 11. The Version 11 model was used to track runoff from the SeaTac Airport as it traveled downstream through the Miller Creek stream system.

May Creek Basin Plan, King County, WA - Mr. Brascher assisted in modeling the May Creek Basin for King County and the City of Renton using HEC-2 and HSPF. Identified drainage problems and solutions in the watershed including the placement of stormwater control facilities.

Chesapeake Bay Watershed Study - Mr. Brascher was a member of the EPA-funded AQUA TERRA simulation team that calibrated streamflows at 38 locations in watersheds draining to the Chesapeake Bay. Using HSPF Version 10 and ANNIE, Mr. Brascher reviewed, updated, and input to WDM files eight years of hydrometeorologic data at 38 locations in four states.

HSPF Calibration of the Chesapeake Bay Watershed Model Phase III - Mr. Brascher assisted in the verification and calibration of the Chesapeake Bay HSPF model, including snow melt parameter adjustments and data preparation.

King County Web Development, King County, WA - Mr. Brascher designed and implemented a data intensive Web application which allows dynamic access to all hydrometeorologic data available from King County. The application uses SQL, Cold Fusion, IIS, and HTML to deliver super fast data access to the general public for nearly a gigabyte of data.

King County VIDS - Mr. Brascher customized the VIDS software to meet the needs of the King County Surface Water Division. This incorporated county-wide mapping and data access to all previously complete computer modeling work.

Grass Lakes Wetland Study, Olympia, WA - Mr. Brascher used the Green Cove Creek HSPF model to evaluate surface and groundwater impacts on hydroperiod fluctuations of the Grass Lakes Wetland.

Quilceda-Allen Watershed Plan, Snohomish County, WA - Assisted county staff in the use of HSPF for watershed planning in Snohomish County. Investigated the impacts of future conditions alternatives and proposed mitigation on streamflow.

Hylebos Creek Study, City of Federal Way, WA - The Hylebos Creek study involved the joint use of the EPA SWMM and HSPF models to determine the extent of the existing flooding problems and to determine the proper location and size of future stormwater detention facilities. This included culvert removal and replacement at several locations throughout the watershed.

Chambers Creek Study, Thurston County, WA - Modeled Chambers Creek streamflow and surface water/groundwater interactions in Thurston County. Evaluated the effects of Chambers Lake outflow to augment downstream streamflow and seasonal groundwater inflow to lake and stream channel.

HSPF Application to the Woodland and Woodard Creek Basins, Thurston County, WA - Mr. Brascher adapted the calibrated Woodland and Woodard Creek HSPF models to represent future full-development conditions. This included the assimilation of all future zoning regulations and any local requirements pertaining to stormwater retention and detention as well as the implementation of regional projects intended to control stream flows.

College Ditch Stormwater Facility, Lacey, WA - Mr. Brascher adapted the Woodland Creek HSPF model to represent the College Ditch area in more detail. This included analysis of several new stormwater and water quality treatment facilities. Hydroperiod analysis was performed to determine the impacts to a ten-acre wetland.

Surface Water Modeling of the Percival Creek Basin, Olympia, WA - Mr. Brascher prepared and calibrated surface water models which represent all developed portions of the Percival Creek Basin. This included analysis of all conveyance systems and existing detention/retention facilities. Identified drainage problems and solutions in the watershed including the placement of regional stormwater control facilities.

SWMM Modeling of the Indian/Moxlie Creek Basin, Olympia, WA - Mr. Brascher applied the EPA SWMM surface and backwater model to the Indian and Moxlie Creek basins. The model was used to assess the impacts of rerouting a section of Indian/Moxlie Creek to improve fish habitat. Analysis included tidal impacts on current and future flood flows, implementation of local ordinances and regulations and solutions to future drainage problems.

Woodard and Green Cove Creek Development Impacts, Thurston County, WA - Mr. Brascher developed a modeling tool using data generated by the existing HSPF version 12 models for both the Green Cove and Woodard Creek watersheds. This tool can be used to evaluate changes in land use and development strategies.

Log Cabin and Cain Engineering Report, Olympia, WA - Mr. Brascher developed and calibrated a surface water model for the Log Cabin and Cain flood mitigation and engineering report. This included development and analysis of alternative solutions and stormwater facility designs.

HSPF Calibration of the Umatilla River - Mr. Brascher constructed and calibrated an HSPF version 12 model of the Umatilla River. This included use of the irrigation module to determine application rates for croplands. Groundwater interaction with streamflow played a key role in the calibration of the model.

Port of Chelan Regional Water Quality Facility - Mr. Brascher acted as an advisor to Forsgren and Associates in the construction and application of an EPA SWMM model to determine current and future flood flows for the Port of Chelan property. These flows were then used to size a water quality sedimentation facility before discharging into the Wenatchee River.

City of Wenatchee Stormwater Study - Mr. Brascher constructed an EPA SWMM model to determine current and future flood flows for the City of Wenatchee. These flows were then used to size future stormwater improvements.

Burien Depression Analysis, Burien, WA - Modeled flood elevations and groundwater impacts in natural depression draining neighborhood of 200 acres. Evaluated alternative and proposed solutions including pumping and diversion of inflows.

Mystic Lake Court Case, King County, WA - Provided hydrologic analysis of lake elevation changes due to development in a 1200 acre upstream basin. Developed HSPF computer model of lake with and without development and analyzed impacts due to future development.

Southeast Olympia Drainage Basin Study, Olympia, WA - Mr. Brascher developed and calibrated a surface water model for the Southeast Olympia area, including detailed analysis of stormwater facilities, stormwater drainage systems and impacts on wetlands.

Snoqualmie Ridge Master Drainage Plan, WA - The Snoqualmie Ridge Master Drainage Plan was produced for Weyerhaeuser/Quadrant for a 1500-acre development, located west of the Town of Snoqualmie. The purpose of the Snoqualmie Ridge Master Drainage Plan was to evaluate the effectiveness of the proposed mitigation efforts for the project site. The modeling effort included assembly and calibration of four separate HSPF subbasin models. The calibrated HSPF models were then used to create dozens of future condition scenarios. The future scenarios were evaluated by the Town of Snoqualmie based on King County Master Drainage Plan requirements for impacts to the onsite and off site streams and wetlands. All modeling results were reviewed by the Town of Snoqualmie and their consultants.

CH13 Drainage Basin Study, Thurston County, WA - Mr. Brascher calibrated a surface water model for subbasin CH13 located in the Chambers Creek watershed. Identifying alternative solutions to current flooding problems and designing stormwater facilities to mitigate the impacts of future development.

Thurston County VIDS - Mr. Brascher customized the VIDS software to meet the needs of the Thurston County Water and Waste Management Division. This incorporated county wide mapping and data access to all previously complete computer modeling work.

City of Kent VIDS - Mr. Brascher customized the VIDS software to meet the needs of the City of Kent Surface Water Division. This incorporated city-wide mapping and data access to all previously complete computer modeling work.