APPENDIX I

Water Quality Technical Memorandum

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NEW WHATCOM REDEVELOPMENT PROJECT WATER QUALITY TECHNICAL REPORT

SUPPLEMENTAL MEMORANDUM

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SUPPLEMENTAL MEMORANDUM PURPOSE

Since the time that the *New Whatcom Redevelopment Project Water Quality Technical Report* (Water Quality Technical Report; A.C. Kindig & Co., December 18, 2007) was prepared for the January 2008 Draft EIS, some conceptual stormwater plans have been revised as the EIS alternatives were refined into a Preferred Alternative by the Port of Bellingham (Port). Differences between the revised stormwater concept plans and the conceptual stormwater plans analyzed for the Draft EIS are identified by kpff Consulting Engineers (kpff 2008). This memorandum evaluates the results of those changes on stormwater quality and identifies the nature and magnitude of differences relative to the analysis in the Draft EIS. This memorandum is intended to support preparation of a Supplemental Draft EIS (SDEIS) for the Preferred Alternative.

The Preferred Alternative is described in detail in Chapter 2 of the Draft SEIS. A summary of the Preferred Alternative prepared by Blumen Consulting Group follows:

> *Based on the information provided in the DEIS, ongoing public input, additional analysis and master planning, and coordination between the Port and the City, as well as other agencies, groups and stakeholders, the Port staff prepared a recommended Proposal to serve as the Preferred Alternative for analysis in the SDEIS. The Preferred Alternative is based on a modified street grid for long-term redevelopment of the Waterfront District in order to provide efficient connection to the City and cost-effective engineering solutions for bridging the bluff and the BNSF railroad corridor. The Preferred Alternative would feature approximately 2.7 million square feet of mixed use redevelopment by 2016, and approximately 6.0 million square feet of mixed use redevelopment by 2026; at buildout the Preferred Alternative would provide 33 acres of open space and parks.*
>
> *Redevelopment under the Preferred Alternative would be within the range of redevelopment assumed for the EIS Alternatives in the January 2008 Draft EIS. Redevelopment under the Preferred Alternative would mix and match elements of the EIS Alternatives. As an example, the redevelopment density under the Preferred Alternative would be comparable to that under EIS Alternatives 2/2a (up to 6 million square feet of office, institutional, marine industrial, residential and retail uses). The amount of parks, trails and habitat area under the Preferred Alternative would be similar to that assumed under Alternative 1 (approximately 33 acres).*

AFFECTED ENVIRONMENT – WATER QUALITY

Although there have been some refinements to the description of the existing stormwater drainage system by kpff (2008), none of the refined information affects the description of existing water quality conditions in the Water Quality Technical Report prepared for the Draft EIS (Appendix G).

CONSTRUCTION WATER QUALITY IMPACTS

With regard to potential influences on stormwater quality, construction under the Preferred Alternative would differ in relationship to grading and in-water work as compared to Alternatives 1 through 3 evaluated in the Draft EIS as follows (See Chapter 2 of the SDEIS for details):

- Smaller boat launches associated with the marina;

- Wave attenuators and rock groins within the waterway would be constructed to provide calmer water for moorage;
- Stormwater outfalls would be constructed two to four feet higher, except in the Marine Trades Area (kpff 2008);

The total volume of grading (cut and fill) would be up to approximately 70,000 cubic yards of cut and up to approximately 700,000 cubic yards of fill, which would be within the grading quantities assumed for Alternatives 1 – 3 in the DEIS.

The amount of in-water work under the Preferred Alternative would be somewhat higher than that described in the Draft EIS for the Whatcom Waterway and evaluated in the Water Quality Technical Report. Construction of the outfalls two to four feet higher in elevation would reduce the potential risk for water quality impacts at those locations during construction relative to that described for Alternatives 1 through 3 in the Draft EIS because Best Management Practices (BMPs) to separate the outfall construction work zones from the water would not need to be as extensive where such construction was not part of other shoreline improvements. Added wave attenuators and rock groins under the Preferred Alternative would increase in-water work relative to Alternatives 1 through 3 in the Whatcom Waterway. Despite differences in in-water work under the Preferred Alternative, stormwater BMPs for in-water work would remain the same as those described for the Draft EIS. There would be no change in assessment of construction water quality impacts under the Preferred Alternative from that for Alternatives 1 through 3 in the Draft EIS. The Draft EIS assessment concluded that no adverse water quality impacts would be anticipated with mitigation included as part of the proposal for Alternatives 1 through 3 (see Draft EIS, Appendix G for details). The Preferred Alternative would have somewhat more in-water work, but the scale of work is similar to that considered in the Draft EIS and would require the same types of BMPs to avoid and minimize water quality impacts as considered in the Draft EIS. Therefore, this assessment concludes no adverse water quality impacts would be anticipated with mitigation included as part of the proposal for Alternatives 1 through 3 and the Preferred Alternative.

POST-CONSTRUCTION WATER QUALITY IMPACTS

Stormwater quality is quantitatively modeled in the Draft EIS (Appendix G) by the following method. Untreated stormwater quality is forecast for each of the proposed nine stormwater catchments or basins, using five categories of land use types, each of which would generate a different quality of stormwater. The stormwater quality predicted for each land use category is based on site-measured and/or data from the literature. The volume-proportionate contribution of each land use category to storm runoff in each basin is calculated using data from the hydrologic model prepared for the Draft EIS. The water quality of runoff from the site (to outfalls A through H and Area 10) is improved by modeled passage through stormwater treatment facilities. The performance of those facilities is based on literature values as described in the Draft EIS. The resulting stormwater quality at discharge is quantitatively estimated at buildout in 2026 for Alternatives 1, 3 and 4 - the No Action Alternative (Tables 3-8 through 3-10 in Appendix G to the Draft EIS) and compared to state standards (WAC 173A-201A) and existing condition data for Bellingham Bay (Station HC-SW-12 for dissolved metals and suspended solids; all other existing condition data are from Ecology's long-term marine discrete sample data for outer Bellingham Bay at Station BLL011 in 2003). The water quality from all storm outfalls combined (to show discharge as though it was one outfall

from the entire site to the Whatcom Waterway and Bellingham Bay) is also calculated for Alternatives 1, 3, and 4 - the No Action Alternative at buildout in 2026. The nine outfalls are proportionately combined using the weighted contributing area of contaminant sources within each catchment that would be treated in the three water quality facility categories examined for the Draft EIS (wet vaults; bioretention; and a 50:50 combination of each).

The Draft EIS and Water Quality Technical Report evaluated stormwater for Alternatives 1 through 3 assuming three potential treatment scenarios: 100 percent wet vault treatment, 100 percent bioretention treatment, and 50% wet vault and 50% bioretention treatment. The Preferred Alternative calls for treatment via two other stormwater facility types, the Filterra® bioretention system and/or the StormFilter™ system. Basic stormwater treatment is required under the Ecology 2005 Manual for the Preferred Alternative and Alternatives 1 through 3 as described in the Draft EIS and the Water Quality Technical Report.[1] All facility types evaluated in the Draft EIS, and the types assumed for the Preferred Alternative in this memorandum, would meet the Basic stormwater treatment criterion.

Filterra® Bioretention System

The Filterra® is a proprietary bioretention system developed by Americast. Filterra® is a bioretention-category planted facility that uses a surface mulch, tree plantings (as proposed under the Preferred Alternative), and an engineered soil media in a constructed "box" with under-drainage. The Washington Department of Ecology (Ecology) issued a conditional short-term use level designation for basic treatment and a pilot use level designation for oil treatment for this facility in November 2006. The conditional use designation expires on November 1, 2009 unless extended by Ecology. The pilot use designation expires on May 1, 2010 unless extended. Contaminant removal performance is summarized in Table 1.

Maintenance consists of biannual inspection, removal of silt and trash from the filter surface, replacement of the surface mulch layer and the upper several inches of soil media as warranted by clogging or fine sediment entrainment (complete soil media replacement is anticipated to be necessary every 10 to 20 years), and vegetation pruning/replanting as warranted.

StormFilter™

The Ecology (2005) Manual includes the proprietary StormFilter™ leaf compost or zeolite media in the media filter treatment category. A general use designation for basic treatment was assigned to StormFilters™ in January 2005 and updated in 2007. The process and apparatus of treating stormwater runoff passing through a leaf compost filter or zeolite material is patented by Stormwater Management™. A media filter removes pollutants through filtration, ion exchange, adsorption, and microbial

[1] Oil treatment is required in certain high-use traffic areas as defined in the Ecology 2005 Manual. High use areas, if any, for the Preferred Alternative would be within the range of Alternatives 1 through 3 evaluated in the Draft EIS, and most similar to Alternative 2. The need for oil water treatment for high use areas would be defined at final design. The analysis in the Draft EIS assumes oil water separators would lower oil and grease concentrations to land use concentrations for untreated runoff identified for each land use category in the Draft EIS, as they are designed to do. If triggered by traffic or certain types of retail/commercial parking, oil/water separation would be provided as required by the Ecology 2005 Manual and would improve water quality for oil and grease and total petroleum hydrocarbons to levels considered in the Draft EIS.

degradation. StormFilter™ inserts use patented cartridges housed in a concrete vault with three chambers: a pretreatment bay, a filter bay, and an outlet bay. Heavier sediments and non-emulsified oils are trapped in the pretreatment bay before filtration. Contaminant removal measurements are shown in Table 2.

StormFilter™ and other media filter maintenance requirements vary from site to site based on the type of land use activity, implementation of source controls, and weather conditions. The Ecology 2005 Manual maintenance specifications require following the manufacturer's operation and maintenance guidelines to maintain design flows and pollutant removals. The maintenance frequency is based on total suspended solids loading and cartridge capacity. Maintenance includes pre-settling chamber cleaning and periodic replacement of the filter cartridges.

Relative to the Draft EIS analysis, the Preferred Alternative using Filterra® systems would be generally within the range of performance of wet vaults and bioretention quantified for Alternatives 1 through 3, and superior to some extent for total suspended solids and ammonia-nitrogen. StormFilter™ systems would be equally effective to wet vaults and bioretention evaluated in the DEIS for total suspended solids, oil and grease, and total petroleum hydrocarbons, but less effective than either wet vaults or bioretention for all other parameters. The relative system performance results are shown in Table 3.

Table 1. Filterra® Bioretention System Performance
(Contaminant Removal as a Percentage)

Reference	TSS	Turb.	TP	Ammonia-Nitrogen	Nitrate +Nitrite-Nitrogen	Lead	Zinc	Copper	Fecal Coliforms	Oil and Grease/TPH
GeoSynetic Consultants (2006)	83-91		49-62		40-45(a)			82-84(b)		
ATR Associates, Inc. (2007)	72-95		65-91							
Yu and Stanford (2006)	88		60		40		48(b)	33(b)		
Overall Filterra® Removal Efficienty	**86**	**86**(c)	**64**	**40**(d)	**40**	**73(d)**	**48**	**55**	**80(**d)	**74(**d)

TSS = Total Suspended Solids; Turb = Turbidity; TP = Total Phosphorus; TPH = Total Petroleum Hydrocarbons
(a) Data shown are for Total Nitrogen.
(b) Data shown are for total metal.
(c) Turbidity estimated as the same as TSS removal.
(d) System performance assumed the same as bioretention performance shown in Table 3-3 of the DEIS Water Quality Technical Report (A.C. Kindig & Co. 2007).

Table 2. StormFilter™ Insert Removal Efficiencies (%)

Reference	TSS	Turb.	TP	Ammonia-Nitrogen	Nitrate +Nitrite-Nitrogen	Lead	Zinc	Copper	Fecal Coliforms	Oil and Grease/TPH
Stormwater Management, Inc., 2000a (Perlite medium) [1]	78									
Stormwater Management, Inc., 2000b (SMZ and Perlite medium) [2]				SMZ and Perlite media are expected to have minor nitrogen removal capability *(Since these values are unknown, a removal of 0% was conservatively assumed)*						86/77
Stormwater Management, Inc., 1999 (SMZ and Perlite medium) [3]	76		38			30	28	34	45	
Overall StormFilter™ Efficiency	**80**	**80**	**30**	**0**	**0**	**30**	**25**	**30**	**45**	**75**

TSS = Total Suspended Solids; Turb = Turbidity

[1] Total Suspended Solids Removal Using StormFilter™ Technology. February 15, 2000. Weighted average for a mixed commercial area and Perlite filter medium. Turbidity is assumed equal to TSS removal.

[2] Oil, Grease and Hydrocarbon Removal Using StormFilter™ Technology. February 14, 2000. Oil and grease removal from a fast food parking lot with an influent of 96 mg/L. Weighted average total petroleum hydrocarbon (TPH) removal from a roadway bridge and DOT maintenance yard using ZeoPerl medium.

[3] Phosphorus and Total Suspended Removal Using Mixture of SMZ and Perlite. May 17, 1999. Weighted average for 12 inflow concentrations ranging from 90 to 200 µg/L TP. Metals data are from 3 replicate samples collected by DOT maintenance facility. Dissolved metals removals assumed proportionate to total metals removal.

[4] Ecology determined the StormFilterTM systems meet the basic and enhanced general use designation, which among other things means an 80% total suspended solids removal is expected from it's analysis and testing of the system.

Table 3. Filterra® and StormFilterTM Contaminant Removal Performance Relative to Wet Vaults and Bioretention Facilities Evaluated in the Draft EIS *(Tables 3-3 and 3-4 of the Water Quality Technical Report, Appendix G of the Draft EIS).*

	TSS	Turb.	TP	Ammonia-Nitrogen	Nitrate +Nitrite-Nitrogen	Lead	Zinc	Copper	Fecal Coliforms	Oil and Grease/TPH
Filterra® Performance Compared to										
Bioretention	greater		lesser	equal	greater	equal	lesser	lesser	equal	
Wet Vault	lesser		greater	greater	greater	greater	greater	greater	greater	
StormFilter™ Performance Compared to										
Bioretention	equal		lesser							equal
Wet Vault	equal		lesser							greater

As part of the refined stormwater concept, there would be some alterations in drainage basin configurations and outfall locations under the Preferred Alternative relative to Alternatives 1 through 3 due to the revised road network; however, the level and

categories of proposed land uses would be within the range envisioned under Alternatives 1 through 3 in the Draft EIS. Combined outfall drainage for Alternatives 1 and 3 (which bracket the land use characteristics of the Preferred Alternative) were quantified in Table 3-11 of the Draft EIS Water Quality Technical Report.

If Filterra® systems were employed for the Preferred Alternative, the water quality result would be similar to that for the 50:50 combination of bioretention and wet vault modeled for the Draft EIS, as shown by the qualitative ranking of facility performance in Table 3. For most stormwater parameters, Filterra® systems would provide a greater level of treatment than wet vaults, and an equal or greater level of treatment than the type of bioretention examined in the Draft EIS. Although variable depending on the specific stormwater constituent, overall the Filterra® system performance is bracketed by the range of stormwater treatment methods examined in the Draft EIS. No adverse impacts to water quality in Bellingham Bay were reasonably anticipated in the Draft EIS, and that same conclusion would apply to the Preferred Alternative. As described in the Draft EIS, stormwater quality from the site would improve under any of the Alternatives, including the Preferred Alternative, because there is no stormwater quality treatment provided for most of the site under existing conditions (see the Draft EIS, Appendix G, for details). No other differences in impacts related to construction or operation would result.

If StormFilter™ systems were employed, the water quality outcome could have somewhat higher concentrations for most stormwater constituents than were estimated by the Draft EIS model. Site-wide, stormwater quality would improve over the existing condition because all pollution-generating surfaces of the site would have water quality treatment. For all but fecal coliforms, the predicted stormwater discharge reported in the Draft EIS was well within state standards prior to any mixing or dilution, to such an extent that the potentially poorer performance of StormFilter™ systems is reasonably expected to still provide an outcome meeting state standards for all but fecal coliforms before any mixing or dilution in Bellingham Bay. Fecal coliforms may be somewhat higher, but the conclusion and explanation in the Draft EIS and Water Quality Technical Report about why fecal coliforms in Bellingham Bay would comply with state standard would remain applicable to the Preferred Alternative with StormFilter™ treatment.

The Draft EIS predicts that fecal coliforms could be above state marine water quality standards at all outfalls under Alternatives 1 and 3. Under the Preferred Alternative using Filterra® systems, fecal coliform concentrations would be lower than forecast in the Draft EIS. Using StormFilter™ systems, fecal coliforms would be higher for the Preferred Alternative than forecast in the Draft EIS. Fecal coliform concentrations would be lowest under bioretention treatment or under Filterra® systems. Fecal coliforms originate from wildlife, including bird droppings, and thus occur wherever storm runoff is generated from impervious surfaces. Pet waste exacerbates fecal coliform concentrations when it is left to run off with stormwater. From a water quality perspective, fecal coliforms are difficult to remove with any water quality facilities, because they readily pass through all saturated flow systems and are small enough for some to pass through filtration-based systems including bioretention, Filterra® and StormFilter™. On a site-wide basis, fecal coliforms after treatment were projected to range from about 38 up to 92 CFU (colony forming units)/100mL under Draft EIS Alternatives 1 and 3. On an outfall by outfall basis, the model predicted a range of 18 to 111 CFU/100 mL. Discrete sampling by Ecology in 2003 indicated outer Bellingham Bay had fecal coliform concentrations between 1 to 2 CFU/100 mL, and the standard is for a

geometric mean under 14 CFU/100mL. Fecal coliforms were not reported for existing site runoff, but given that there is no stormwater quality treatment for runoff at present that would remove fecal coliforms, the Preferred Alternative would likely result in a near-comparable source of fecal coliforms to the existing industrial condition (i.e., the residential component and pets may add fecal coliforms, but runoff from all pollution-generating surfaces would be treated and thus remove more fecal coliforms than at present).

Even under existing untreated conditions for most of the site, the concentration of fecal coliforms in Bellingham Bay is low and Ecology considers that fecal coliform standards in Bellingham Bay are being met. As described in the Draft EIS, given (1) steps taken by the City of Bellingham to remove Combined Sewer Overflow (CSO) influence to Bellingham Bay at C Street near the site, (2) the Whatcom Creek Total Maximum Daily Load (TMDL) to reduce fecal coliform sources in the Whatcom Creek watershed that drains to Bellingham Bay at the Whatcom Waterway, and (3) fecal coliforms in storm runoff are discharged without treatment under existing conditions, it is probable that fecal coliform concentrations in Bellingham Bay near the site would be improved or at worst unchanged by buildout in 2026 under the Preferred Alternative, regardless of whether Filterra® or StormFilter™ systems were constructed. Since fecal coliforms are within standards in Bellingham Bay at present, it is probable they would remain so under the Preferred Alternative. To the extent bioretention or Filterra® systems are employed more than vault or other stormwater treatment facilities with redevelopment, fecal coliform concentrations would occur at the lower ends of the ranges quantified in the Draft EIS.

MITIGATING MEASURES FOR WATER QUALITY

Prior Mitigation Measures

All mitigation measures identified in the Draft EIS for construction and post-construction water quality would apply to the Preferred Alternative.

New Recommended Mitigation Measure for the Preferred Alternative

Although not required to maintain water quality standards, it is recommended that Filterra® systems or equivalent be employed for the Preferred Alternative rather than StormFilter™ systems or equivalent, to the extent feasible by site requirements and the Conditional Use designation for Filterra® systems by Ecology. Use of Filterra® systems or equivalent would produce better stormwater quality based on the typical performance data for both systems.

UNAVOIDABLE ADVERSE IMPACTS FOR WATER QUALITY

Unavoidable adverse impacts would be unchanged from those identified in the Draft EIS and Water Quality Technical Report.

REFERENCES

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