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5	AIRPORT COMMUNITIES ) COALITION, )	No. 01-160			
6	) Appellant, )	THIRD DECLARATION OF WILLIAM			
7	V. )	A. ROZEBOOM RELATING TO ACC'S MOTION FOR STAY			
8	)				
9	STATE OF WASHINGTON,)DEPARTMENT OF ECOLOGY; and)	(Section 401 Certification No. 1996-4-02325 and CZMA concurrency			
10	THE PORT OF SEATTLE,	statement, Issued August 10, 2001, Reissued September 21, 2001, under			
11	Respondents.	No. 1996-4-02325 (Amended-1))			
12	)				
13	William A. Rozeboom declares as follows:				
14	1. I am over the age of 18, am competent to testify, and have personal knowledge of				
15	the facts stated herein.				
16	2. This is my third declaration to the Pollution Control Hearings Board (PCHB) in				
17	the matter of Section 401 Certification No. 1996-4-02325. My first declaration to the PCHB, in				
18	support of ACC's motion for stay, was dated 11 September 2001. My second declaration to the				
19	PCHB, in support of ACC's reply on motion for stay, was dated 8 October 2001.				
20					
21					
22	employed as a senior engineer with Northwest Hydraulic Consultants. I have over 20 years of				
23	specialized experience in surface water hydrology and hydraulics. My curriculum vitae was				
24	attached as Exhibit A to my first declaration.				
25	THIRD DECLARATION OF WILLIAM A. ROZEBOOM - 1	HELSELL FETTERMAN LLPRachael Paschal Osborn1500 Puget Sound PlazaAttorney at Law			
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4. Northwest Hydraulic Consultants has been retained since October 1999 on behalf of the Airport Communities Coalition (ACC) to provide technical reviews of stormwater facilities and related streamflow impacts from the proposed 3rd runway and other development at SeaTac Airport. I have been responsible for this review work.. I have reviewed all stormwater management plans, natural resources mitigation plans, low flow analyses, and related documents which have been prepared by or for the Port of Seattle for airport improvements. My review findings were expressed to Ecology and/or the Corps of Engineers in a series of letters dated 11/24/1999, 5/3/2000, 7/31/2000, 9/7/2000, 9/21/2000, 9/25/2000, 9/27/2000, 2/15/2001, 4/30/2001, 6/25/2001, 7/23/2001, 8/6/2001, and 11/26/01. Internal review and quality assurance for these letters was provided by co-signer Dr. Malcolm Leytham, PE, who is a principal with NHC. Independent reviews by King County and Pacific Groundwater Group, under separate contracts to Ecology, have generally corroborated the concerns expressed by our review letters.

5. The main purpose of this third declaration is to have the record include my November 26, 2001 comment letter to the U.S. Army Corps of Engineers, regarding the Port of Seattle's Low Flow Mitigation. That letter is attached as Exhibit A. The letter provides a review of recently-obtained documents and identifies significant technical deficiencies in the Port's low flow analyses. The consequence of these deficiencies is that low flow impacts will be underestimated and that storage vaults proposed to store low flow augmentation water will be undersized. These latest technical deficiencies with the Port's low flow analysis and mitigation plan compound the still-unaddressed problems and uncertainties identified in my first and second declarations.

THIRD DECLARATION OF WILLIAM A. **ROZEBOOM - 2** 

HELSELL FETTERMAN LLP 1500 Puget Sound Plaza 1325 Fourth Avenue Seattle, WA 98101-2509 Rachael Paschal Osborn Attorney at Law 2421 West Mission Avenue Spokane, WA 99201

6. A secondary purpose of this declaration is to respond to the third declaration of Paul Fendt, dated 26 November 2001 and submitted to the PCHB with the Port of Seattle's 26 November 2001 response to ACC's motion to supplement. That declaration contains unsupported and/or inaccurate statements.

7. Paragraph 15 of Mr. Fendt's third declaration states, "Ecology has required that a small amount of total site stormwater be retained for use during low-flow periods to mitigate for low flow reductions." Paragraph 23 asserts that "It is also important to realize the project's low flow impacts involve relatively small amounts of water." I disagree with these characterizations of the amount of water required for low flow mitigation. Tables in the July 2001 draft low streamflow analysis show that a total of 24 acre-feet of storage, in enclosed vaults, is required for low streamflow augmentation. For context, an Olympic-size swimming pool holds about 4000 cubic meters or 3.24 acre-feet of water. The volumes of site stormwater required under the Port's draft document for low flow mitigation are large and significant and will require construction of watertight storage facilities equivalent to more than seven Olympic-size swimming pools.

8. Paragraph 18 of Mr. Fendt's third declaration states that "whatever the requirements for low streamflow mitigation, there is ample stormwater to retain and mitigate those impacts." Paragraph 20 states that "the amount of stormwater to be collected and released can be adjusted" and that "stormwater would be available for storage." These statements are not substantiated by any analyses or documentation. Also, the more difficult issue is not whether stormwater is available for capture, but rather what storage volume must be constructed now, at significant cost. Due to even larger costs of retrofit construction, and probable disruption to airport operations, it is in my opinion THIRD DECLARATION OF WILLIAM A. HELSELL FETTERMAN LLP RoZEBOOM - 3

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unrealistic to propose that the capacity of reserve storage vaults for low flow augmentation (which limits the amount of stormwater which can be collected) would ever be enlarged beyond the sizes which are constructed at the time of the other Master Plan Update projects.

9. Paragraph 21 of Mr. Fendt's third declaration states (in bold font) that "The Revised Modeling Analysis Will Show That Total Impacts Will Not Be Significantly Different Than Originally Anticipated." This statement predicts a future outcome and is speculative. Also, it conflicts with the prediction made by the Port just one month earlier. An October 24, 2001 letter from the Port (Keith Smith) to Ecology (Ann Kenny) requested an extension to the deadline for submitting a revised low streamflow analysis because "the modeled embankment flow was 1/24 of what it should have been" . . . "the actual impacts to summer low flow will be less than previously thought, and the facilities proposed to offset the impacts can be reduced in size." Now, Mr. Fendt's declaration indicates that the Port's previous prediction is in error and that no change is expected. The revised analysis appears to be a work in progress and the impacts to be shown by that analysis are not known. The adequacy of that revised analysis in responding to previously identified issues and uncertainties is also not known.

10. Recent documents obtained by ACC public disclosure requests indicate that the low flow analysis is in a state of flux and that the proposed analysis methods continue to change. Notes from the Port and Ecology 401 Permit – Post-Issuance Clarification Low Flow Analysis Meeting of October 30, 2001 indicate that numerous changes are proposed to the low flow modeling methods. Changes include but are not limited to a "revised approach to modeling of impervious area at embankment filter strips" and use of "a 1-dimensional version of the Hydrus model, rather than the

5 THIRD DECLARATION OF WILLIAM A. ROZEBOOM - 4

HELSELL FETTERMAN LLP 1500 Puget Sound Plaza 1325 Fourth Avenue Seattle, WA 98101-2509 Rachael Paschal Osborn Attorney at Law 2421 West Mission Avenue Spokane, WA 99201

revised low flow analysis is also in flux. Ecology's 401 Certification conditions originally specified that a revised low flow analysis be submitted by November 5, 2001. The Port's October 24, 2001 letter to Ecology requested that the submittal date be extended to November 21, 2001. Most recently, Mr. Fendt's third declaration states at Paragraph 17 that the revised analysis will be submitted to Ecology by December 17, 2001. With this record of changes, it is uncertain what specific analysis methods will eventually be used for the low streamflow analysis, or when coherent documentation of that analysis will be available for independent technical review.

2-d version used previously." The recent documents indicate that the schedule for completing a

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11. Our previous comments in this matter are on record and remain unresolved. By my letter of November 26, 2001, attached as Exhibit A, additional serious technical problems are 12 identified in the latest versions of the Port's low flow analyses. The documentation of the low 13 streamflow evaluation continues to be so poor as to make an informed review virtually 14 impossible. There continues to be an absence of critical design and project operation 15 information necessary to demonstrate how the system will function in practice. Because of these 16 deficiencies, the Port's proposal does not provide any assurance that impacts to low streamflows 17 18 will be adequately identified or mitigated.

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DATED this 28 day of November 2001, at Tukwila, Washington.

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25 THIRD DECLARATION OF WILLIAM A. **ROZEBOOM - 5** 

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**Rachael Paschal Osborn** Attorney at Law 2421 West Mission Avenue Spokane, WA 99201

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P.02

# northwest hydraulic consultants inc.

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November 26, 2001

Colonel Ralph H. Graves Ms. Muffy Walker Ms. Gail Terzi U.S. Army Corps of Engineers Seattle District P. O. Box 3755 Seattle, WA 98124-3755

Dear Colonel Graves, Ms. Walker and Ms. Terzi:

Re: Corps Ref. No. 1996-4-02325: Port of Seattle Low Flow Mitigation

As you know, Northwest Hydraulic Consultants has been retained on behalf of the Airport Communities Coalition (ACC) to provide a technical review of stormwater facilities and streamflow impacts from development activities at SeaTac airport. The main purpose of this letter is to serve as a reminder that there are numerous substantive deficiencies and uncertainties in the Port's proposed plans for low flow mitigation in Miller, Walker, and Des Moines Creeks. This letter is also intended to identify an additional serious deficiency which we have not addressed previously, but which is evident from documents recently obtained by the ACC.

Our previous comments in this matter are already on record and remain unresolved. The most recent of those comments are in the form of legal declarations by William Rozeboom and are cited in Peter Eglick's letter to you dated November 16, 2001. Now, as then, public comment is forced to rely on incomplete draft documents. In the case of the Port's Low Flow Analysis, the documentation of the evaluation continues to be so poor as to make an informed review virtually impossible. There continues to be an absence of critical design and project operation information necessary to demonstrate how the system will function in practice. Because of these deficiencies, the Port's proposal does not provide any assurance that impacts to low streamflows will be adequately identified or mitigated.

We had hoped to have the opportunity to review a credible "final draft" of the Port's low flow analysis and mitigation plan prior to offering additional comments. However, the ACC has expressed concern over the possibility that the Corps might reach a decision regarding the third runway in advance of that opportunity, and has requested that we now convey any additional comments we might have based on the latest documents. In that light, please regard the comments in this letter as supplementing the points made in Mr. Rozeboom's declarations in September and October 2001.





November 26, 2001

Since the date of Mr. Rozeboom's declarations, several additional documents have been obtained by ACC public disclosure requests which pertain to the low-flow analyses. We have a few additional comments based on the recent documents identified below.

- Report dated August 8, 2001, by Pacific Groundwater Group for the Port of Seattle, "Port of Seattle Sea-Tac Third Runway Embankment Fill Modeling."
- Letter dated October 24, 2001, from Keith Smith, Port of Seattle, to Ann Kenny, Ecology, regarding Low Streamflow Analysis and Summer Low Flow Impact Offset Facility Proposal. The letter requests a time extension to finalize the Low Streamflow proposal and asserts that the "actual impacts to summer low flow will be less than previously thought, and the facilities proposed to offset the impacts can be reduced in size."
- E-mail dated October 25, 2001, regarding "Pre Low Flow Meeting Briefing" from Kelly Whiting (King County) to Ann Kenny and Raymond Hellwig, Ecology.
- Undated "Notes on HSPF Modeling of Miller, Walker and Des Moines Creeks" by Norm Crawford of Hydrocomp, retained by the Port.
- 401 Permit-Post-Issuance Clarification Sea-Tac International Airport, Third Runway Draft Meeting Notes, Low Flow Analysis, October 30, 2001.

Our first comment pertains to how the low flow revision process is being conducted, and in particular whether the many outstanding certification requirements and public comments are being addressed. The above documents show that the Port is requesting a time extension to finalize the Low Streamflow proposal. But the October 25, 2001, e-mail from Kelly Whiting indicates that the Port's HSPF consultant was "not aware of anything being done to address comments other than those by Hydrocomp." It is of concern that as close as two weeks before the end of the 45-day period specified by Ecology for the Port to submit a revised low flow analysis, there is no evidence of progress by the Port in responding to the numerous low streamflow mitigation issues raised by King County and incorporated as conditions for the 401 certification. The Corps should be concerned by this and the fact that even less attention is apparently being given by the Port in responding to outstanding public comments presented by us and other technical experts on behalf of the ACC.

Our main additional technical comment is that there are serious flaws in the Port's analysis of runway secondary recharge which cause the volumes of embankment recharge to be greatly overstated, stream low flow impacts to be understated, and reserve storage mitigation volumes to be correspondingly undersized. These are discussed below.

November 26, 2001

The main issue or question is, how much of the runoff from runway and taxiway impervious surfaces will infiltrate into pervious grassed filter strips adjacent to the runway? The answer to that question can be addressed by comparing the filter strip infiltration capacity to the intensity at which water is applied to the filter strip. In this case, the rate of water being applied is equal to the intensity of the rain falling directly on the strip plus the rate of runoff onto the strip from runway and taxiway impervious surfaces. When the input intensity (direct rainfall plus runway runoff) is greater than the soil infiltration capacity, then the excess water flows off as surface runoff and/or shallow subsurface flow and is captured by the storm drain system.

The recent August 2001 embankment fill modeling report by the Port's consultant, Pacific Groundwater Group, incorporates a critical (and incorrect) assumption that all runoff from the runway impervious areas is infiltrated to groundwater. This is justified by the statement (PGG report page 4) that "Earth Tech's analysis indicates that virtually all runoff from runways should infiltrate in the filter strips." The Earth Tech analysis referenced was prepared by Earth Tech for the Port in a December 2000 report titled "Seattle-Tacoma Airport Master Plan Update Low Streamflow Analysis." However, close examination of the Earth Tech report shows that the Earth Tech analysis does not support the assumption adopted by PGG. Instead, Earth Tech (pg 11) reports that: 1) pavement runoff occurs about 18% of the time, and that surface runoff would occur less than 5% of the time. Graphs in the Earth Tech report show that "time" refers to the full analysis period including dry not-raining conditions. The Earth Tech graphs are blank (do not show any data) for the wettest 5% of time. The Earth Tech results are therefore properly interpreted as saying that surface runoff from the filter strips should be expected to occur up to 27% (5/18) of the time that rainfall (and runoff) occur. The Earth Tech analysis completely fails to address and quantify the filter strip runoff and infiltration performance during the wettest 5% of all time, corresponding to the wettest 50% of all hours with some rainfall, when infiltration capacity is most likely to be exceeded. Because of this significant deficiency, the Earth Tech analysis does not support a conclusion that "virtually all runoff from runways should infiltrate."

The adoption of an hourly time step is another significant flaw in the past and proposed analyses by the Port's consultants. One practical consequence of using HSPF hourly modeling to determine runway runoff is that the HSPF model generally (and inaccurately in this context) artificially damps out runoff resulting from short bursts of rainfall. For accuracy, a much shorter time step should be used which is consistent with the very short time needed for water to sheet-flow across a 105-foot wide runway half-section. Using the guidance of the 1998 King County Surface Water Design Manual (pg 3-7), "[T]he quicker a basin responds hydrologically (e.g., due to small size, land cover, or lack of detention), the smaller the time step should be." Also (pg 3-23), peak flow analyses should use a maximum time interval of 15-minutes, corresponding to the shortest time step for which continuous data are readily available. Hourly data will fail to provide reliable results. It should be recognized that even the 15-minute data will underestimate peak flows from the runway to the filter strip and hence overestimate the capacity of the filter strip to infiltrate this flow.

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A continuous duration 15-minute time series data set of SeaTac Airport rainfall for water years 1949 through 1998 was developed by King County and is publicly available from the county's website. We evaluated these data to make an independent estimate of how much runway runoff would exceed the filter strip infiltration capacity and therefore be unavailable to provide recharge. The 15-minute data set consists of 1,753,152 individual data values for the 50 years of record. Non-zero rainfall is reported by 95,345 of these data values, representing about 5% of the full record. In other words, the data show that it rains about 5% of the time and that it is not raining about 95% of the time. A similar review of the hourly rainfall data for SeaTac Airport found that rain occurs in about 11% of all hours of record. Earth Tech's hourly low flow analysis reported (pg 11) that runway runoff occurs about 18% of the time (meaning 18% of all hours of record). Clearly, use of an hourly time step and then adding flow routing with HSPF has the effect of exaggerating the duration of time when runway runoff occurs and suppressing the intensity of that runoff. The 5% versus 18% numbers suggest that the Port's low flow analyses may have very significant (over 300%) errors in the timing and rate of peak flows available for secondary recharge, due to use of hourly rainfall routing simulations rather than a smaller and more applicable time step.

Estimation of filter strip infiltration capacity requires an estimate of the maximum rate at which infiltration can occur. This is a difficult number to estimate with accuracy. Also, if the filter strip is intended to provide a water quality function by trapping particulates, as we understand is being proposed, then it should be expected that the strip will tend to plug up and lose infiltration capacity over time. Pacific Groundwater Group, in an earlier June 2000 report for Ecology, estimated the hydraulic conductivity of the embankment fill matrix at 1.35E-4 cm/sec, which is equivalent to about 0.19 inches per hour. In previous comments, we observed that this infiltration rate seemed too high in light of the flow monitoring data collected by the Port to quantify actual embankment runoff. For our independent assessment of infiltration strip capacity, we used the maximum filter strip infiltration rate indicated from Figure 3 of the Earth Tech report prepared for the Port. This rate, 6.0E-5 cfs in a 30 foot by 1 foot segment of taxiway filter strip, is equivalent to 0.0864 inches per hour (or 0.0216 inches in 15 minutes), and may be a reasonable estimate of infiltration capacity for a filter strip providing water quality treatment.

Our independent assessment of runway runoff and filter strip infiltration capacity examined the scenario of a one-foot wide half-section of runway 105 feet long onto an adjoining filter strip 75 long. This is the same as the runway scenario examined by Earth Tech. We adopted a direct approach which ignored evaporation losses from the runway surface and assumed that the amount of runoff from the runway in any 15-minute period was equal to the quantity of rainfall on the runway in that same 15-minute period. With this approach, the total water input to the filter strip including both direct rainfall and runway runoff is 2.4 times the amount of direct rainfall alone. The capacity of a 75-foot by 1-foot filter strip using the Earth Tech infiltration value is 0.0216 inches in 15 minutes considering direct rainfall alone. After adjusting for the 2.4x rainfall multiplier effect of runway runoff, the infiltration capacity of the filter strip will be reached, and outflow to the storm drain system will occur, whenever it rains more than 0.009

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inches in 15 minutes. The amount (depth) of surface runoff during that same period is equal to the 15-minute rainfall intensity minus 0.009 inches.

With the above assumptions, analysis of the SeaTac 15-minute rainfall record from King County shows that surface runoff will occur about 2.8% of all time. Considering only those 15-minute intervals having some rainfall, surface runoff occurs 52% of the rainy-interval time and accounts for about 53% of the total rainfall volume. In a similar analysis using hourly data, we found that surface runoff would occur about 4% of all time. Considering only the 1-hour intervals having some rainfall, surface runoff occurs 35% of the rainy-interval time and accounts for about 53% of the total rainfall volume. This analysis confirms that Earth Tech's statement of "runoff occurs less than 5% of the time" based on hourly data is technically accurate in a limited context but is extremely misleading and has been misapplied in subsequent analyses by PGG. The more accurate 15-minute analysis of rainfall and runoff volumes shows that more than one half of the total volume of rain and runway runoff will be discharged as surface water to the storm drain system, and will not be available to provide groundwater recharge as has been assumed by the Port's consultants.

The Low Flow Analysis Draft Meeting Notes of October 30, 2001 describe "new" modeling methods which if implemented will further overestimate recharge to the embankment and underestimate impacts to stream low flows and mitigation requirements. The latest proposal as we understand it is to add embankment "AGWI" hourly data (HSPF-derived inflow to groundwater) plus runway "SURO" hourly data (HSPF-derived surface runoff) to compute the total water available to the filter strips. Then, "[P]eak flows to the filter strips that are greater than the infiltration capacity of the filter strips will be categorized as surface runoff, and not used in Hydrus. Flows less than the infiltration capacity of the filter strips will be input to Hydrus." This method as proposed has two significant flaws. First, the total water to the filter strips is the direct rainfall on the filter strip (not AGWI) plus runway runoff. The problem with AGWI in this application is that it is a residual amount after surface and interflow amounts have been subtracted and which therefore underestimates the total volume of input to the filter strip. Another problem with AGWI in this application is that it has attenuation and time lag effects which would mask the actual peak inflows. The problem with applying "excess" SURO amounts directly to groundwater is that it ignores the surface runoff amounts which serve to recharge soil moisture and which are lost to plant evapotranspiration. The proposed "new" methods will produce artificially-high estimates of groundwater recharge, and will compound the time-step problems which were the main focus of this letter.

It is difficult to provide meaningful comments on this moving target of a low flow analysis and mitigation plan when even the most recent report (PGG, August 2001) is obsolete by the time it becomes available for public review. It bears notice that the Port's internal review of low flow materials not available to the public found significant errors in the Port's analysis and that our above review based on the more limited public document set has also found significant errors. On behalf of the ACC, we request that the Corps withhold its decision in the matter of the third

November 26, 2001

runway until after the Port has prepared and delivered a final and complete low flow mitigation plan and the public is given a reasonable amount of time to review and comment on that plan.

Thank you for your consideration of our concerns.

Sincerely,

northwest hydraulic consultants

Welliam X

William A. Rozeboom, P.E. Senior Engineer

K. Malcolm Leytham, PhD, P.E. Principal

cc: Peter Eglick, Helsell Fetterman LLP Kimberly Lockard, Airport Communities Coalition

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4	POLLUTION CONTROL HEARINGS BOARD				
5	FOR THE STATE OF WASHINGTON				
6	AIRPORT COMMUNITIES COALITION,	) ) No. 01-160			
7	Appellant,	)			
8	v.	) CERTIFICATE OF SERVICE			
9	STATE OF WASHINGTON,	) (Section 401 Certification No.			
10	DEPARTMENT OF ECOLOGY; and THE PORT OF SEATTLE,	<ul> <li>1996-4-02325 and CZMA concurrency</li> <li>statement, issued August 10, 2001,</li> </ul>			
11	Respondents.	<ul> <li>Reissued September 21, 2001, under No.</li> <li>1996-4-02325 (Amended-1))</li> </ul>			
12		)			
13					
14	I, Andrea Grad, an employee of Helsell Fetterman LLP, attorneys for the Airport				
15	Communities Coalition, certify that:				
16	I am now, and at all times herein mentioned was, a citizen of the United States, a resident of				
17	the State of Washington, and over the age of eighteen years.				
18	On November 28, 2001, I caused to be sent via facsimile and via U.S. Mail, First Class, a				
19	true and correct copy of ACC's Reply on Motion to Supplement the Record on Motion for Stay, and the Third Declaration of Bill Rozeboom Relating to ACC's Motion for Stay, with attachment, in the				
20					
21					
22	above-captioned case to:				
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24		HELSELL FETTERMAN LLP Rachael Paschal Osborn			
25		1500 Puget Sound PlazaAttorney at Law1325 Fourth Avenue2421 West Mission Avenue			
	CERTIFICATE OF SERVICE - 1	Seattle, WA 98101-2509 Spokane, WA 99201			

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9	Seattle, WA 98101	Seattle, WA 98101		
	Fax: (206) 447-9700	Fax: (206) 292-6301		
10	L certify under nonalty of norium (under	the lower of the State - CANT - 1		
11	I certify under penalty of perjury under the laws of the State of Washington that the			
12	foregoing is true and correct.			
13	DATED this 28th day of November, 2001, at Seattle, Washington.			
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25		HELSELL FETTERMAN LLP 1500 Puget Sound Plaza	Rachael Paschal Osborn Attorney at Law	
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