

**Table 3.4-5
Summary of Stormwater Flow Information for Streams in the Study Area**

Stream	Non-Erodible Flow Criteria ¹	Frequency the Non-Erodible Flow Criteria was exceeded Pre-urbanization	Existing Peak Flows in cubic feet per second (cfs)	Current Detention Criteria (Design Storm Standards) ²	Stream Peak Flows Resulting from Buildout of Entire Basins, Including Areas Within and Outside the Subarea Based on Current Detention Standards and Regional Detention Facilities Identified in Drainage Basin Plans. These are Stormwater Model Results from the City's Drainage Basin Plans. Assumptions used in the model included: <ul style="list-style-type: none"> Taking out ESAs, and assuming high impervious surfaces for remaining area - about 90% for industrial uses, 50% for multiple family properties. Detention standards shown in column 4 (current detention criteria). Regional detention facilities proposed in the Plans are constructed. Note that where regional detention facilities were included in the adopted plan, the facilities and status of the facilities is described. 	Peak Flow Results from Stormwater Model Runs Using New State Standards for Detention. ³ (From Table 3.4-4) Assumptions included: <ul style="list-style-type: none"> Taking out ESAs and using 86% impervious surface for the remaining land in the Subarea. No increase in impervious surface was assumed for areas outside the subarea. Only existing regional detention facilities were assumed. 	Theoretical Change in Existing Stream Peak Flows Resulting From Buildout in the Subarea Based on Using the New State Standard for Detention ⁴ (See Table 3.4-4 for existing peak flows.)
Swamp Creek	unknown	unknown	2 year: 56.9 10 yr: 137.5	10/25 ⁵	The City does not have an adopted drainage basin plan for Swamp Creek, as it was outside the City limits when the Drainage Basin Plans were originally completed in 1982. No new regional detention ponds are proposed in the basin.	2 year: 52.0 cfs 10 year: 137.5 cfs	Decrease in flows in 2 year storm, flows stay the same in 10 year storm
Japanese Gulch Creek	16 cfs ⁶	once every 5 years	2 year: 40 10 yr: 62.6	10/25	Draft Update to Drainage Basin Plan - has not been adopted, but included the following alternatives. Alt 1: On-site detention only & 10/25 standard 2 year: 59 cfs 10 year: 98 cfs Alt 2: New State Standards for detention. Change operation of Paine Field detention pond to restrict peak outflow to 9 cfs (increase detention). (The pond is also a wetland mitigation area, so flows would not be restricted during the early growing season to protect wetland vegetation.) This will likely not occur due to the potential for open water detention areas to attract nuisance birds to the airport. 2 year: 16 cfs 10 year: 62 cfs	2 year: 29 cfs 10 year: 69.1 cfs Erodible flow criteria will occur approximately every year, but less often than currently occurring.	Decreasing flows in 2 year storm (the most frequent storm), increasing flows for 5, 10, and 25 year storm.
Edgewater Creek	8 cfs	once every 5 years	2 year: 6.5 10 yr: 22.	2/25	No regional detention ponds proposed, since any pond would have to be in riparian corridor. Plan includes replacement of 2 undersized storm drains on Mukilteo Blvd. 2 year: 10 cfs 10 year: 23 cfs	2 year: 5.5 cfs 10 year: 39.3 cfs Erodible flow criteria will not be exceeded in a 2 year storm, but will be exceeded in a 10 year storm.	Decreasing flows in 2 year storm, increasing flows for 5, 10, and 25 year storms.
Powder Mill Creek	17.6 cfs	once every 5 years, with significant erosion occurring once every 10 years.	2 year: 60.6 10 yr: 88.5	2/25	The adopted plan included 3 regional detention ponds, one of which has been constructed (north of Merrill Creek Parkway on Seaway Center). The other 2 regional detention ponds will likely not be built: These were to have been located on Boeing property, and at the south end of the basin near Kasch Park bog. 2 year: 50 cfs 10 year: 69 cfs	2 year: 54.6 cfs 10 year: 88.5 cfs Erodible flow criteria will be exceeded in a 2 year storm.	Decreasing flows in 2 year storm, flows stay the same in 10 year storm.

¹ Estimated by Brown and Caldwell Engineers for City of Everett 1982 Drainage Basin Plans.

² Predevelopment/Post development. E.g. for Japanese Gulch, when the 25 year storm falls on the developed site, sufficient detention must be provided so that the peak stormwater release rate is equal to the current (undeveloped conditions) release rate from a 10 year storm.
³ Standard will be the same for all basins: The peak discharge rate for a 2 year, 24 hour storm shall not exceed 50% of the peak runoff rate for the same storm and existing site conditions and the peak discharge rates for the 10 and 100 year, 24 hour storms shall not exceed the peak runoff rate for the same storm and existing site conditions. Theoretically this standard will reduce storm flows in a 2 year storm for all basins in the City. However, for some sites such as forested areas and infiltration areas, there is no runoff in a 2 year storm, and therefore a standard that uses 50% of an existing discharge of 0 will not increase detention over a standard that uses 100% of the current 2 year storm (those basins with a current detention criteria of 2/25). See Section 3.4.3.2 for additional information regarding stormwater detention standards.

⁴ See Table 3.4-2 for additional details regarding existing peak flows and projected peak flows.

⁵ However most of the recent projects in Swamp Creek basin have had to obtain an HPA, and the new state standards have been required for these projects by the Department of Fish and Wildlife.

⁶ To eliminate spawning bed scour in the lower reaches, stream flow velocities need to be 6 feet per second (FPS) or less. Stream flow in the lower reaches of Japanese Gulch will need to be controlled to 16 cfs or less to keep the stream velocity to 6 FPS or less.

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Narbeck Creek	4.8 cfs	Pre-urbanization flows were 2 cfs for 2 year storm and 58 cfs for 25 year storm.	2 year: 15.4 10 yr: 37.3	5/25	The adopted plan included the use of Narbeck Swamp for regional detention. This is not likely to happen now, since raising water levels would impact the wetland, and Paine Field is currently proposing the use of Narbeck Swamp and adjacent areas for a wetland mitigation bank. 2 year: 17 cfs 10 year: 36 cfs An alternative which was not adopted included on-site detention only. Peak flows modeled for that alternative were: 2 year: 34 cfs 10 year: 65 cfs	2 year: 10.7 cfs 10 year: 37.3 cfs Erodible flow criteria will be exceeded in a 2 year storm.	Decreasing flows in 2 year storm, flows stay the same in 10 year storm.
Merrill and Ring Creek	20 cfs	once every 5 years	2 year: 5.0 10 yr: 24.0	5/25	The adopted plan included construction of a regional pond south of Westridge Mobile Home Park, which has not yet been completed; and expansion of the regional pond at Merrill Creek Parkway, which has been completed. The plan also included installation of parallel culverts at Veralene Way, which have not been constructed. The parallel culverts will decrease flooding and will increase flows slightly because water will no longer be backing up. 2 year: 25 cfs 10 year: 66 cfs	2 year: 13 cfs 10 year: 61 cfs Flows will be lower than shown if the regional pond south of Westridge Mobile Home Park is constructed. Flows may increase slightly if the parallel culverts at Veralene Way are constructed. Erodible flow criteria will not be exceeded in a 2 year storm.	Increasing flows in both the 2 year and 10 year storms.
Glenwood Creek	16 cfs	once every 5 years	2 year: 13.5 10 yr: 34.7	2/25	The adopted plan includes an expanded bypass storm drain system, which has been completed; and in-line underground detention on Glenwood Ave., which has not yet been completed. The plan also included in-line underground detention on both sides of the Maple Heights Bridge in Harborview Park. This will likely not be constructed due to the high cost and impacts to the park. 2 year: 3.0 cfs 10 year: 11.6 cfs	2 year: 12.3 cfs 10 year: 34.7 cfs Erodible flow criteria will not be exceeded in a 2 year storm.	Slight decrease in flows in 2 year storm, flows stay the same in 10 year storm.
Pigeon Creek #2	18 cfs	once every 5 to 10 years	2 year: 43.0 10 yr: 64.0	2/25	The adopted plan included 3 regional ponds. Two of the ponds are no longer proposed due to contamination on one site (near Highland Ave. by Hannabrook), and wetland impacts on the other site (near Seahurst Ave.). The third pond is proposed on Associated Sand and Gravel property and could be constructed as a joint venture with the city when the property develops. The adopted Drainage Basin Plan includes preservation of a groundwater recharge site on Associated Sand and Gravel property located south of Sievers Duecy Blvd. 2 year: 12 cfs 10 year: 27 cfs	2 year: 39 cfs 10 year: 64 cfs Note: While this analysis did not include the reduction in flows from a potential regional detention pond on Associated Sand and Gravel property, it did include the assumption that the flows for the west branch of Pigeon Creek No. 2 continue to fully infiltrate on Associated property south of Sievers Duecy Blvd. Flows will be lower than shown if the regional pond is constructed. Erodible flow criteria will be exceeded in a 2 year storm.	Decrease in flows in 2 year storm, flows stay the same in 10 year storm.