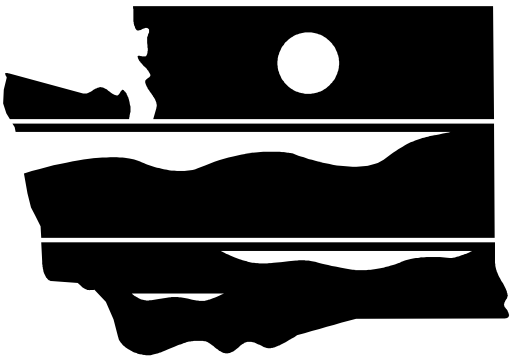

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Document Summaries and Areas for Further Investigation Sea-Tac Fill Hydrologic Studies

December 1999
Ecology Publication No. 00-10-003

JE9907

December 16, 1999

Washington State Department of Ecology, NWRO
3190 160th Ave SE
Bellevue, WA 98008-5452

Attn: Dave Garland

Re: SeaTac Runway Fill Hydrologic Studies Task 2.4 Report

Dear Dave,

This report identifies existing documents reviewed as part of the SeaTac Hydrologic Studies project, summarizes data available in some of those documents, and describes changes to project scope recommended as a result of document review. Pacific Groundwater Group was authorized to begin the SeaTac Runway Fill Hydrologic Studies project by Dan Silver, Deputy Director of Washington State Department of Ecology, on September 16, 1999. The original scope was based on review of the *Final Environmental Impact Statement for the Seattle-Tacoma International Airport Master Plan Update*. Tasks for the project are:

Task 1 – Project Management
Task 2 – Interview Key People and Review Documents
Task 3 – Confirm or Modify Project Scope
Task 4 – Fill Gaps in Understanding
Task 5 – Independent Evaluation of Existing Conditions and Construction Effects
Task 6 – Final Report
Task 7 – Public Information and Community Outreach

The major disciplines involved in the work are surface water hydrology, storm water hydrology, groundwater hydrology, wetlands ecology, and aquatic biology. Earth Tech, Inc. is subcontracted to Pacific Groundwater Group to perform surface and stormwater hydrology, and Ecology and Environment Inc. is subcontracted to conduct wetlands ecology and aquatic biology work.

The project has been designed to respond to the development and evaluation of hydrologic issues related to construction of the proposed third runway embankment at SeaTac International

airport. The purpose of this interim report is to identify documents reviewed as part of Task 2, identify changes in understanding of hydrologic issues, identify data sources that may have changed since publication of the EIS, and specify changes to our project approach that respond to the new information and understanding. Changes to scope affect Tasks 4 and 5. A contract amendment is being prepared to formally document the changes.

Status of Data Review

The original period scheduled for the collection of existing information ended in September 1999. Communication with Port consultants indicated that the Stormwater Management Plan, certain geologic analyses, and the Biologic Assessment would not be available in September. Therefore, the window for collecting existing information was extended through October 1999. The geologic data were provided between October 19 and November 1. On November 9, 1999, our project team received the Preliminary Stormwater Management Plan. The Revised Draft Biological Assessment was received on November 17, 1999. The recently acquired Stormwater Management Plan and Biologic Assessment were not re-viewed in detail for preparation of this summary.

The project will continue to review additional documents as the Port and other sources make them available. However, our ability to respond to changes in information and issues will decrease as time elapses and budget is expended.

Surface Water Hydrology

Data have been reviewed regarding surface water hydrology of the Seattle Tacoma International Airport (STIA), the Third Runway project, the broader Master Plan Update Improvements, and the surrounding watersheds of Des Moines, Miller and Walker creeks. The attached bibliography lists those documents received by the project team relevant to surface water hydrology. The information was obtained through the Department of Ecology, Port of Seattle, concerned citizens, and local pub-lic agencies. The information can be categorized as follows:

Watershed Information

This category includes prior studies, plans and reports addressing the stream systems and tributary drainages in the Des Moines, Miller and Walker Creek watersheds. The documents include comprehensive stormwater management plans for local municipalities, facility and water quality studies, reconnaissance reports and maps, basin plans and stream gauge data. Also included in this category is information derived through interviews with concerned citizens and with Port of Seattle staff and their consultants.

General Information

This category is comprised of reports and studies of related topics not specific to STIA. Examples include biologic effects of de-icing materials, geomorphologic effects of urbanization, and surface water facility design standards.

Project Specific Information

This category consists of reports and data directly related to the proposed Third Runway embankment and other Master Plan improvements. These documents consist of the Final Environmental Impact Statement (FEIS), temporary erosion and sediment control plans, design drawings and maps, hydrologic modeling data and reports for the FEIS, the stormwater management plan for the Master Plan Update, wetland studies and natural resource mitigation plans. Project-specific information was also developed from interviews conducted with concerned citizens, Port of Seattle staff and Port consultants.

Results of Preliminary Review

Based on preliminary review of the existing available data, no changes are recommended to the general scope of the surface water evaluations to be performed under Task 5; however, the Stormwater Master Plan is a complex document that requires additional review. Based on Task 2 work the following five key issues have been identified to focus the analysis:

Evaluate temporary construction phase impacts and the adequacy of proposed control measures. Review performance of prior applications of similar BMPs to large-scale embankment construction. Assess critical construction planning and execution factors such as the phasing of construction, sizing and space planning for temporary controls, controlling exposure of embankment subgrade to wet weather, wet weather construction restrictions, retaining wall construction impacts, control of runoff from fill once crowned, and construction access impacts.

Review of the target flow regime selection. The Stormwater Master Plan (Parametrix, November 1999) identifies a set of stream flow conditions that define a target regime for storm water facility design. This project will evaluate whether the target flow regime adequately characterizes hydrology that will support a stable stream system, assess whether the effects of predevelopment storage elements (natural depressions) have been considered in the target regime, and review effects of spatially distributed seep and spring contributions on hydrologic model results.

Review low flow impact analyses. The project will assess the effect of storage within the embankment fill, how it affects baseflow in streams, and whether release of stored water mitigates low flow reductions. The project will also review estimates of low flow augmentation from discontinued agricultural irrigation and discharge of imported potable water through abandoned septic drainfields.

Evaluate the adequacy of proposed flow control measures. The project will evaluate how baseflows have been considered in establishing the required flow control facilities, consider effects of the relative timing of embankment construction impacts and mitigation being placed on-line, and review effects of new development on downstream regional facilities.

Evaluate adequacy of proposed water quality control measures. The project will review performance and sizing criteria to be applied in design of water quality treatment facilities, consider scope and expected performance and reliability of proposed BMPs, review sampling data from similarly controlled areas of the airport, and assess temperature effects of land conversion on Walker Creek.

Groundwater Hydrology

The Port of Seattle, concerned citizens, and the cities surrounding the SeaTac airport provided existing documents pertaining to groundwater conditions. Many of these documents were reviewed and key people were interviewed to provide a technical basis for confirming the scope of work for the groundwater area of this study. The initial groundwater focus was shallow groundwater systems, specifically investigating baseflow to surface waters, relationships between perched groundwater and underlying aquifers, and relationships between groundwater, wetlands, and surface water. This focus has not changed; however, the drilling and water level monitoring tasks have been modified based on our document review.

Field Tasks

The field activities that have been identified for this area of the study are two rounds of streamflow measurements and water quality sampling, borehole logging, water level measurements, and a well inventory.

As part of our investigation into the relationship between groundwater and surface water, we intend to identify areas of groundwater discharge to Miller, Walker, and Des Moines Creeks. At present, King County has three operating streamflow gages on Miller Creek, one on Walker Creek, and five on Des Moines Creek. Streamflow measurements are recorded every 15-minutes at each of these gages. The spacing of the King County gages is too great for our purposes; therefore, the team will collect streamflow data at additional stations and combine the new data with King County data for analysis. Because water levels are seasonal, one round of measurements was made in October when levels were low and the process will be repeated at the same stations in the winter when levels are high. Surface water quality samples were collected from Miller and Des Moines Creeks during the first round of measurements and will be repeated in the second round.

The initial scope of work included a drilling task intended to improve stratigraphic understanding, provide for future monitoring, and augment existing monitoring networks. Because of the focus on shallow groundwater systems, monitoring wells completed in the regional shallow aquifer and in perched groundwater zones are of most interest. Glacial till

perches groundwater in the area and therefore the thickness and properties of the till are also important.

PGG reviewed the boring locations and logs generated by Port consultants. A preliminary assessment of available monitoring wells for the borrow areas and proposed retaining walls was performed based on consultant reports. Well completions above and in the regional shallow aquifer were noted. Based on this review, eight monitoring wells that are completed in the regional shallow aquifer appear to exist in Borrow Area 1. Boring logs for these wells identify the glacial till contacts. Twelve monitoring wells appear to exist in Borrow Area 3. Five are completed in the regional aquifer with till contacts identified in three of the logs. Three wells appear to be completed above the regional aquifer. There are three monitoring wells completed above the regional aquifer in Borrow Area 4.

The Port is currently conducting a geotechnical-drilling program that is focussed on the areas surrounding the proposed retaining walls. The fall 1999 exploration plan in the area north of the airport proposed drilling 23 borings at a maximum spacing of 100-feet. The plan included installation of monitoring wells in every borehole where field conditions permit. The target completion depths for these wells are above the till where perched conditions exist, otherwise, the wells will be completed in the shallow regional aquifer. The exploration plans for the west and south retaining walls have not been reviewed in preparation of this document. PGG was informed by Port consultants that the exploration program in the north area followed standard procedures that will be repeated in the west and south this winter (including well density).

In addition to the fall 1999 and winter 2000 drilling program, we identified 19 existing monitoring wells in the areas surrounding the retaining walls proposed north and west of the airport. Based on preliminary review, four of these were completed in the regional aquifer and the remainders were completed above the aquifer. All but two well logs identify till contacts. When borings extended beneath the till, both till contacts were identified in the log. The top of the till is identified in logs when drilling was halted before penetrating the full thickness of the till.

Following the fall 1999 and winter 2000 explorations, the monitoring wells will be spaced densely enough for the conceptual groundwater flow model required of this project. Understanding of the local stratigraphy would not be significantly improved with additional drilling performed specifically for this project. Therefore, we have removed the separate drilling task from our scope. Permission has been granted for a representative of the PGG team to observe drilling throughout the fall 1999 and winter 2000 program and independent logs of the soils will be generated. Although the proposed drilling schedule is suitable for this project's purposes, delays could force data evaluation to occur before drilling is complete. Independent logging of borings planned by the Port will give our team the opportunity to observe the soils in the area, evaluate the quality of logs generated by others, and will provide a frame of reference when reviewing well logs generated by others.

Initially, groundwater level monitoring was included in our scope of work. The objective of this task was to collect data that could be used to investigate the fluctuation of shallow and

perched groundwater levels. We also intend to use the groundwater level data to investigate the source of water to wetlands in the area. A groundwater-monitoring program is being conducted by Port consultants. Synoptic, monthly water level measurements occur in 44 monitoring wells located in areas of the proposed retaining walls and borrow areas. Based on our preliminary data review, 14 of these monitoring wells are completed in the shallow regional aquifer and 15 are completed above the regional aquifer. We understand that all additional wells added this winter will be included in the water level monitoring program.

Additional project-specific water level measurements are not necessary to meet project objectives if Port data are confirmed to be collected in accordance with standard practice. Therefore, a representative of the PGG team will accompany Port consultants on a minimum of one round of water levels to familiarize ourselves with well locations and conditions and to assess the methods of data collection and data accuracy. We assume that the methods of measurement will be acceptable and therefore at this time we plan to use groundwater level data collected by Port consultants.

In a separate task with a possible field component, the basis for the existing well database compiled by Port consultants will be evaluated. Reportedly, the database contains records of 3000 wells both on and off airport property. Our information is that the database records were not verified in the field. One purpose of this our well inventory is to review the database records for completeness. Another purpose is to investigate the presence and proper decommissioning of wells in the buy-out area. Well sites will be visited or telephone surveyed to verify database information and to assess proper well identification and decommissioning within the buy-out area.

Analytical Tasks

The groundwater analysis will still focus on combining new field data with existing data to establish conceptual models of the current conditions and to assess the effects of the proposed construction on the hydrogeologic environment. Our approach to regional groundwater recharge evaluation has not been altered from the original scope.

Conceptual models of shallow groundwater conditions will be reported through cross sections, groundwater level maps, and till structure maps. The data source for these products will be boring logs and groundwater level monitoring conducted by Port consultants. Geologic cross sections perpendicular to, and coincident with, each proposed retaining wall and borrow area will be generated because of the potential impact to wetlands. A shallow water level evaluation and glacial till structure maps will be generated to investigate perching horizons. The results of the models will be evaluated to predict groundwater perching and discharge to wetlands and surface waters. Conceptual models of the effect of the fill embankment will be quantified by modeling pre-and-post-construction groundwater flow through the shallow soils and glacial till.

Possible Contaminated Fill

Fourteen million cubic yards of Maury Island fill may be used to construct the embankment for the third runway. Available analytical data on the metal chemistry of Maury Island fill have been compiled and tables have been prepared comparing the results to established background levels and State of Washington MTCA cleanup levels and freshwater sediment standards. The top eighteen inches of soil at Maury Island contains high levels of arsenic, cadmium, and lead as a result of aerial deposition of contaminants from the ASARCO mining operation. Ecology has stipulated that no fill for the airport project will exceed MTCA Method A cleanup levels (which are protective of human health). Preliminary review indicates that MTCA Method A standards are lower (more conservative) than the Washington freshwater sediment standards for these metals and therefore, for these metals, the MTCA standards are protective of both human and freshwater sediment receptors. Also, Maury Island soil samples below eighteen inches were below MTCA Level A criteria; therefore, use of the fill should not pose an unacceptable risk to human or ecological receptors, and modeling of fill chemistry impacts will not be necessary.

Wetland Ecology

The *Wetland Delineation Report, Wetland Functional Assessment and Impact Analysis,* and *Natural Resource Mitigation Plan* for the Seattle-Tacoma International Airport Master Plan Update Improvements have been reviewed. The delineation report supplements previous work. This report states that wetland delineations were field verified by the US Army Corps of Engineers (USACE). USACE verification has been confirmed independently by the team. This verification is critical to the overall acceptance of conclusions in this and subsequent documents.

The wetland delineation report forms the basis for the functional analysis that establishes the anticipated level of impact. Although the report is well prepared, there are some data gaps that need further analysis. One impact that is not thoroughly discussed is the change in habitat function that might result from the reduction in size of wetlands along the western edge of the runway extension. Up to fifty percent of the wetland area will be eliminated from some of the bigger wetlands. In addition, there is no discussion regarding long term impacts resulting from reduction in size.

Based on review of these documents and concurrence with Ecology, the team will not conduct the wetland confirmation fieldwork originally planned for Task 4. Efforts will focus on the proposed mitigation ratios and mitigation sites. The mitigation ratios evaluation will assess how the SeaTac project fits into the overall mitigation history of the Seattle USACE. The mitigation ratios used for the airport project will be compared to mitigation ratios that Seattle USACE have accepted previously. A reconnaissance level survey of several of the identified mitigation sites was conducted to verify that the selected sites meet the needs of the project. In addition, the team will contact Ecology wetland specialists to discuss the success of mitigation projects in the State of Washington and to determine the key factors for project success.

The existing data review and scope considerations required more time than originally anticipated.

Aquatic Biology

Reports supplied by the Port and citizens were reviewed. Many organizations evaluated in-stream and riparian habitat of Miller and Des Moines Creeks for current or potential use by salmonids, primarily coho salmon (*Oncorhynchus kisutch*), cutthroat trout (*O. clarki*), steelhead (*O. mykiss*), and chum salmon (*O. keta*) (Trout Unlimited, 1993; Shapiro and Associates, 1994; Des Moines Creek Basin Committee, 1997; Parametrix Inc., 1998; BioAnalysts Inc., 1998). The reports have generally similar findings with some exceptions. Limiting factors for the ability of these creeks to support fish populations include physical habitat, water quality, hydrology, and migration barriers. Although urbanization has degraded the habitat of the creeks, anadromous salmon runs (primarily coho salmon) still exist on Miller, Walker, and Des Moines Creeks. However, it is unclear if the current coho salmon runs are a result of natural reproduction or local hatchery releases. The occurrence of naturally reproducing populations of anadromous salmon indicates a creek's ability to support and sustain natural populations of anadromous salmon. Outstanding issues include:

- Are hatchery fish the majority of anadromous salmonid runs?
- What is the potential for these creeks to support natural anadromous salmonid runs?
- Will the proposed mitigation projects promote healthier populations of resident fish, particularly salmonids?

Performing habitat surveys or rapid bioassessments, as originally proposed, would not provide valuable or new information for Miller and Des Moines Creeks. However, Walker Creek, a tributary of Miller Creek, only has been surveyed once. Therefore, a survey of Walker Creek habitat was performed to verify previous study results and confirm the baseline habitat characteristics. Walker Creek was surveyed using methods found in *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, Second Edition* (EPA 1999).

The data review revealed uncertainties associated with anadromous fish returns and spawning activity in Miller, Walker, and Des Moines Creeks. The proportion of marked (adipose fin clip) and unmarked (no adipose fin clip) fish reported in annual fish returns is inconsistent. All fish released from WDFW hatcheries receive an adipose fin clip. However, the Miller Creek Hatchery operated by Trout Unlimited does not clip coho salmon adipose fins because the fish are too small to clip at the time of release. E & E surveyed the proportion of marked and unmarked anadromous fish returns to provide an indication of whether the creeks are populated with natural and Miller Creek hatchery runs, or WDFW hatchery runs. Naturally reproducing salmon runs would demonstrate that the creeks have suitable habitat to sustain salmon populations. A carcass survey was performed in early December 1999. The results of carcass survey will not be used to estimate populations of anadromous fish returns, but for establishing the ratio of marked and unmarked fish in each creek. The survey focused on the reach of Miller and Walker Creeks used by anadromous fish, namely from

Puget Sound to 1st Avenue South. Investigations on Des Moines Creek focused on the reach between Puget Sound and Marine View Drive.

Reports of the occurrence of spawning on Miller Creek are inconsistent. The WDFW (1996) reported no spawning activity, but Trout Unlimited (numerous years) and Bioanalysts, Inc. (1998) reported anadromous fish spawning in Miller Creek. Qualitative spawner surveys and redd counts were performed on the Miller and Walker Creeks from Puget Sound to 1st Avenue South and on Des Moines Creek between Puget Sound and Marine View Drive to assess the presence or absence of spawning. The spawner surveys were timed to coincide with the returns of anadromous fish. Although spawner survey results will not be used to quantify the actual success of anadromous fish spawning efforts, they will be used to document the occurrence of spawning on Miller and Walker Creeks.

The carcass and spawner survey results are limited in their ability to determine whether hatchery fish comprise the majority of anadromous salmonid runs and what the potential is for these creeks to support natural anadromous salmonid runs. Unmarked fish in the anadromous salmon returns on each creek either could be from natural reproduction or the Miller Creek hatchery because neither have an adipose fin clip. Second, the occurrence of spawning on the creeks does not ensure successful spawning and emergence of juvenile fish in the spring. Water chemistry parameters, such as dissolved oxygen and temperature, and degree of sedimentation are significant factors in the success of any spawning activity. Therefore, E&E proposes to seine each creek for juvenile salmon in areas where fish were observed during the carcass and spawner surveys. The seining fieldwork will be timed to coincide with the probable time of juvenile salmon emergence and will be conducted prior to any releases by the Miller Creek Hatchery. Juvenile salmon seining efforts will document the success of salmon spawning efforts and will assess whether naturally reproducing populations of anadromous salmon exist in Miller, Walker, or Des Moines Creek.

Originally, E&E proposed to use the Des Moines Creek Basin Plan as a guide to survey Des Moines Creek from Puget Sound to the intersection with South 200th Street and identify specific habitat restoration mitigation projects that could be implemented. However, recent discussions with members of the Basin Plan Committee indicated that habitat restoration projects on Des Moines Creek would provide no benefit until the flow regime of Des Moines Creek was controlled. Phase I of the Basin Plan addresses the flow regime of Des Moines Creek and is currently subject to approval by the Basin Plan Committee. Design and planning stage may begin as early as Spring 2000. Therefore, E&E will not survey Des Moines Creek to identify specific mitigation projects.

The Natural Resource Mitigation Plan prepared by Parametrix, Inc. for the Port of Seattle appears comprehensive. To assess the validity of this plan from a fish habitat perspective, the four in-stream mitigation projects proposed for Miller Creek were field surveyed.

The approach to threatened and endangered species, and biota other than fish, is consistent with the original proposal; however, this may change after reviewing the Biological Assessment. The Biological Assessment will be reviewed to identify proposed takes to threatened, endangered, or candidate species. Informal consultations with USFWS, NMFS, and

WDFW have begun in order to obtain the current species list and their opinions of the project. The USFWS lists two threatened species that may be found in the project area: chinook salmon (*O. tshawytscha*) in the Puget Sound region and the bull trout (*Salvelinus confluentus*) in coastal streams of the Puget Sound area. Neither fish is expected to currently occur in Miller, Walker, or Des Moines Creek. Chinook salmon or bull trout were not found in the creeks in recent surveys; however, historical information needs to be reviewed to evaluate if populations of chinook salmon or bull trout historically existed in the creeks. The WDFW lists 39 candidate fish species and 2 sensitive fish species as of August 25, 1999. The listed species are not expected to occur in Miller, Walker, or Des Moines Creek; however, formal consultation with WDFW is needed to confirm this assumption.

I trust this report communicates the required information. If you have questions please call.

Respectfully,
Pacific Groundwater Group

Charles Ellingson
Principal

cc: Louise Flynn, Ecology and Environment

Rick Schaefer, Earth Tech

Attachment 1 – Bibliography for SeaTac Runway Fill Hydrologic Studies

This bibliography lists the documents compiled by Pacific Groundwater Group, Earth Tech, and Ecology and Environment for the referenced project as of December 1, 1999. Not all of the documents have been reviewed at this time. Some duplication exists between the two subsections to follow.

Surface Water Hydrology, Wetlands, and Ecology Bibliography of Documents Obtained by Earth Tech and Ecology and Environment

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11A, Des Moines Creek at Tyee Regional Pond, Sea-Tac. SW 06 T22N R4E; Water year 1991 (October 1990 - September 1991) Mean daily discharge in cubic feet/second.

11A, TYEE POND DISCHARGE, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

11A, TYEE POND OUTLET, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

11A, TYEE POND DISCHARGE, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

11B, Tyee Regional Pond (stage), Sea-Tac. SW 06 T22N R4E, Water year 1989 (October 1988 - September 1989), Mean daily pond level in feet.

11B, Tyee Regional Pond (stage), Sea-Tac. SW 06 T22N R4E, Water year 1990 (October 1989 - September 1990), Mean daily pond level in feet.

11B, Tyee Regional Pond (stage), Sea-Tac. W 06 T22N R4E, Water year 1991 (October 1990 - September 1991), Mean daily pond level in feet.

11B, TYEE POND STAGE, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

11B, TYEE POND STAGE, Water year 1993 (October 1992 - September 1993), Mean daily pond level in feet.

11B, TYEE POND STAGE, Water year 1994 (October 1993 - September 1994), Mean daily pond level in feet.

11C, Des Moines Creek above Tyee Regional Pond, Sea-Tac. NW 06 T22N R4E, Water year 1989 (October 1988 - September 1989), Mean daily discharge in cubic feet/second.

11C, DES MOINES CREEK ABOVE TYEE POND, Water year 1990 (October 1989 - September 1990), Mean daily discharge in cubic feet/second.

11C, DES MOINES CREEK ABOVE TYEE POND, Water year 1991 (October 1990 - September 1991), Mean daily discharge in cubic feet/second.

11C, ABOVE TYEE REGIONAL POND, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

11C, DES MOINES CREEK ABOVE TYEE POND, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

11C, DES MOINES CREEK ABOVE TYEE POND, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

11D, DES MOINES CREEK NEAR MOUTH, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

11D, DES MOINES CREEK NEAR MOUTH, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

11D, DES MOINES CREEK NEAR MOUTH, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

11U, TYEE RAIN GAGE, Water year 1992 (October 1991 - September 1992), Rainfall in inches.

11U, TYEE RAIN GAGE, Water year 1993 (October 1992 - September 1993), Rainfall in inches.

11U, TYEE POND RAIN GAUGE, Water year 1994 (October 1993 - September 1994), Rainfall in inches.

Miller Creek

42A, MILLER CREEK, Water year 1989 (October 1988 - September 1989), Mean daily discharge in cubic feet/second.

42A, MILLER CREEK, Water year 1990 (October 1989 - September 1990), Mean daily discharge in cubic feet/second.

42A, MILLER CREEK, Water year 1991 (October 1990 - September 1991), Mean daily discharge in cubic feet/second.

42A, MILLER CREEK, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

42A, MILLER CREEK ABOVE SW 175TH PL IN NORMANDY PARK, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42A, MILLER CREEK MOUTH, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42B, LAKE REBA OUTLET, Water year 1991 (October 1990 - September 1991), Mean daily discharge in cubic feet/second.

42B, LAKE REBA, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

42B, LAKE REBA CONTROL, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42B, LAKE REBA CONTROL, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42C, MILLER "I" POND, Water year 1992 (October 1991 - September 1992), Mean daily discharge in cubic feet/second.

42C, MILLER "I" POND, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42C, MILLER "I" POND, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42D, MILLER CREEK AT 140TH, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42D, MILLER CREEK @ 140TH, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42E, WALKER CREEK ABOVE SW 175TH PL IN NORMANDY PARK, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42E, WALKER CREEK, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42F, 42F, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42F, LAKE REBA INFLOW #1, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42G, LAKE REBA INFLOW #2, Water year 1993 (October 1992 - September 1993), Mean daily discharge in cubic feet/second.

42G, LAKE REBA INFLOW #2, Water year 1994 (October 1993 - September 1994), Mean daily discharge in cubic feet/second.

42U, LAKE REBA RAIN NORTH OF SEATAC AIRPORT, Water year 1990 (October 1989 - September 1990), Rainfall in inches.

42U, LAKE REBA RAIN NORTH OF SEATAC AIRPORT, Water year 1991 (October 1990 - September 1991), Rainfall in inches.

42U, LAKE REBA RAIN NORTH OF SEATAC AIRPORT, Water year 1992 (October 1991 - September 1992), Rainfall in inches.

42U, LAKE REBA RAIN GAGE, Water year 1993 (October 1992 - September 1993), Rainfall in inches.

42U, LAKE REBA RAIN GAUGE, Water year 1994 (October 1993 - September 1994), Rainfall in inches.

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