APPENDIX A

Year 2000 Water Quality Data Summary

GREEN RIVER WATER QUALITY DATA SUMMARY FOR YEAR 2000

Prepared for

King County

Prepared by

James Keithly and Carl Stivers

Anchor Environmental, L.L.C.

1423 Third Avenue, Suite 300

Seattle, Washington 98101

May 20, 2004

INTRODUCTION

As part of King County's evaluation of water quality monitoring data, an evaluation of water quality monitoring for the Green River and its tributaries was performed. This Section compares the data collected for Year 2000 to Washington State Water Quality Criteria. It also compares these results to King County's Habitat-Limiting Factor's Report (King County 2000) which contains a previous evaluation of water quality data for this watershed.

WATER QUALITY CRITERIA

The State of Washington's Water Quality Standards for Surface Waters (WAC 173-201A) were used for comparison to evaluate the data collected for Year 2000. All references to criteria or standards are comparisons to Washington State Standards. The State's standards recently changed (effective August 1, 2003) from being based on surface water classifications (e.g., Class A, Excellent) to being use-based. The use-based standards classify waters into various designated beneficial uses (e.g., primary contact recreation and Salmon/Trout Rearing) and provide an improved means of protecting the uses of each body of water. These use-based standards were also used for the analysis of 1996-1999 data (Habitat-Limiting Factors and Reconnaissance Report, King County 2000) for the Green River watershed; however the standards used were draft when that document was prepared and changed between the draft and final versions. These changes complicate the comparison of past evaluations of water quality data to the Year 2000 results in some instances because data were being compared to different criteria.

Green River Water Quality Assessment

The purpose of this assessment is to compare the Year 2000 data to Water Quality Criteria and to compare this data to a previous assessment of the 1996-1999 data. The 1996-1999 and older data were evaluated in King County's Habitat-Limiting Factors Report (King County 2000). To simplify comparisons, this assessment is structured in a manner similar to the Habitat-Limiting Factors Report. The report divides the Green River watershed into various subbasins and stream reaches that correspond to both the water quality monitoring conducted by King County and to the reaches used by Washington State Department of Ecology for the 303(d) list of impaired waterbodies. All references to the 303(d) list are to Ecology's 1998 revision.

MIDDLE GREEN RIVER

The Middle Green River begins at river mile 61, Tacoma's Diversion Dam, and continues downstream to river mile 32, the Auburn Narrows. This stretch of river covers the majority of the Green River in the Middle Green River Subwatershed. This section of river is designated as both Core and Noncore Salmon/Trout habitat, Extraordinary/Primary Contact Recreation, and has all possible water supply and miscellaneous uses. Monthly water quality data was collected at Stations A319 (river mile 34) and B319 (river mile 41.5).

Temperature

Although temperatures in 2000 were generally below the Core / Noncore Salmonid Criteria, there was one measurement of 17.5°C at station A319 in August, which equals the Noncore Salmonid criteria. Since data were collected monthly, it is likely that this does not represent the maximum temperature that occurred over this period. The 1996 to 1999 data (King County 2000) also contained no violations of the relevant temperature criteria, but similar concerns were raised regarding the fact that the monthly temperatures measured do not represent maximum temperatures. The Middle Green River is on the 303(d) list of impaired waterbodies for temperature.

Dissolved Oxygen

Dissolved oxygen generally met the Core Salmonid criteria in 2000, with one exception at Station B319 in April. The April reading at this station was 8.85 mg/L, which is below the 9.5 mg/L Core Salmonid criteria. The results for 1996 to 1999 contained only one result at station A319 that was less than the 9.5 mg/L core criteria, but station B319 had 9 of 50 results that were below the proposed salmonid rearing criteria (10.5 mg/L) and had a minimum value of 8.5 mg/L.

Turbidity, Ammonia, and pH

Turbidity was generally low (<3 NTU) in 2000 and the highest value was 16 NTUs, which was measured on May 9. This is similar to the 1996 to 1999 results, where

turbidity was low (2-3 NTUs) with a few exceptions associated with storm events. Turbidity does not appear to be a parameter of concern for salmonids.

Ammonia and pH did not exceeded the pertinent water quality criteria in 2000, and only one pH results observed was slightly less (6.4) than the 6.5-8.5 pH standard in the 1996 to 1999 monitoring. In 2000, ammonia was consistently quite low (i.e., < 0.2 mg/L or not detected) and pH was generally between 7 and 8, but was always between 6.5 and 8.5.

Fecal Coliform Bacteria

The Middle Green River is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and the data collected in 2000 indicate that coliform exceeded the extraordinary primary contact recreational criteria (geometric mean of 50 colony forming units (CFU) / 100 milliliters) at station A319 in May and July (no data were collected at this station in June) and in June at station B319. At station A319, the May sample contained 260 CFU / 100mL and 80 CFU/100mL in July. Station B319 contained 68 CFU/100mL in June. The data for remaining months did not exceed water quality criteria. Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

The metals evaluated (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc) were generally not detected in 2000 and do not appear to be a water quality concern. Detected metals were always below the relevant total or dissolved hardness-adjusted water quality criteria. However, several metals (i.e., lead, mercury, selenium and silver) had analytical detection limits that were slightly greater than the hardness-adjusted water quality criteria so it is not possible to evaluate compliance. This is consistent with the 1996 to 1999 data, which also indicate that metals are not a concern in the Middle Green River.

LOWER GREEN RIVER

The Lower Green River begins at river mile 32, Tacoma's Diversion Dam, and continues downstream to river mile 11, which is roughly the confluence with the Black River. This is a largely urban stretch of river and flows through the cities of Kent, Auburn, Tukwila,

Federal Way and SeaTac. The land uses in the area surrounding the river reflect the urban nature of this reach and include residential, commercial, industrial, agricultural, land uses and also contain major highways (i.e., I-5, Highway 169).

The Lower Green River is classified as Noncore Salmon/Trout Habitat, Primary Contact Recreation and has all possible water supply and miscellaneous uses. It is listed on Washington State's 303(d) list of impaired waters for chromium, fecal coliform, mercury and temperature. Monthly water quality data were collected at Stations O311 (river mile ~12.8) and 3106 (river mile ~13.3) near the lower end of this reach of river.

Temperature

Temperatures were generally below the Core / Noncore Salmonid Criteria, but August 2000 measurements at both stations exceeded the 17.5°C criteria (20.1 and 20.3°C). This is consistent with the 303(d) listing of this section of river for temperature and with the results observed for 1996 to 1999, where a number of measurements exceeded the Class A criterion of 18°C in mid- to late-summer.

Dissolved Oxygen

In 2000, dissolved oxygen generally met the Noncore Salmonid criteria, but dropped below the 8 mg/L criteria at both stations in August (7 and 7.9 mg/L). Because the solubility of oxygen is temperature dependent, it is not surprising that the lowest dissolved oxygen was observed with the highest temperatures. This is virtually identical to the result observed between 1996 and 1999, where dissolved oxygen dropped below salmonid-related criteria in the late summer months.

Turbidity, Ammonia, and pH

Turbidity was generally between 4-5 NTU in 2000 and the highest value was 11 NTUs, which was measured on February 1. This is similar to the 1996 to 1999 results, where turbidity was low (4-5 NTUs) with a few exceptions associated with storm events.

Ammonia and pH did not exceeded the pertinent water quality criteria in 2000, but there were 5 measurements that were less than the 6.5-8.5 pH criteria in the 1996 to 1999 data.

Ammonia was consistently quite low in 2000 (i.e., < 0.2 mg/L or not detected) and this is consistent with previous data.

Fecal Coliform Bacteria

The Lower Green River is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and the data collected in 2000 indicate that coliform exceeded the primary contact recreational criteria (geometric mean of 100 CFU / 100 milliliters) at station O311 in September (160 CFU/100mL) and in February, June, September and November at station 3106. The June sample from station 3106 contained 1200 CFU / 100mL, and the remaining results ranged from 130 to 340 CFU / 100mL). Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

The metals evaluated (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc) were either not detected or detected at concentrations below the relevant water quality criteria in 2000. For the Year 2000 data, metals do not appear to be a water quality concern. However, several metals (i.e., lead, mercury, selenium and silver) had analytical detection limits slightly greater than the hardness-adjusted water quality criteria so it is not possible to evaluate compliance. The 2000 results are consistent with the 1996 to 1999 data, which also contained no violations of water quality criteria for these metals and indicated that metals are not a concern for Lower Green River water quality.

DUWAMISH WATERWAY AND RIVER

The Duwamish River starts at river mile 11, at the confluence of the Green and Black Rivers and extends north until it empties into Elliot Bay. This is a highly industrialized and urbanized estuary / river system that has been extensively modified. The oldest of these modifications include channeling the Cedar River into Lake Washington to provide sufficient flow for the Ballard Locks and closing the Black River, which drained Lake Washington. The more obvious changes to the Duwamish are related to the filling of the river delta wetlands and the industrial and urban nature of the current channel and surrounding land. This reach of river is designated for Salmon/Trout rearing,

secondary contact recreation and has all water supply and miscellaneous uses, except domestic water. The Duwamish is listed on the State's 303(d) list of impaired waterbodies for pH, dissolved oxygen, and fecal coliform bacteria.

Monthly monitoring results for Year 2000 are available from Station 0305 (river mile 0.25), Station 0307 (river mile 3.5) and Station 0309 (River Mile 6.75). At stations 0305 and 0307, two measurements were made each time data were collected. It is apparent from the data (i.e., especially total suspended solids, temperature, and dissolved oxygen) that different depths were sampled that frequently corresponded to the upper freshwater layer and the lower salt water wedge. All data for the Duwamish River were compared to marine criteria because estuarine systems are generally dominated by a saltwater community of organisms. The Habitat-Limiting Factors Report (King County 2000) also compared data for the Duwamish River to marine criteria for this reason.

Temperature

Temperatures at Station 0305 did not exceed the 16°C "Excellent" criteria for marine water during 2000. At Station 0307 this criteria was exceeded in June (16.3°C) and August (17.4°C). Temperature at station 0309 (freshwater only), exceeded the 17.5°C Salmon/Trout rearing and migration criteria with a measurement of 21.6°C on August 1, 2000. This appears similar to the results reported in the Habitat-Limiting Factors Report (King County 2000), which reported an overall increase of maximum temperatures of 2°C since 1970 and between 1 and 15 observations of temperatures greater than applicable criteria for each decade between 1970 and 1998.

Dissolved Oxygen

The Habitat-Limiting Factors Report indicated that the actions taken by King County to divert industrial and sewage discharges from the Duwamish Waterway have resulted in increased DO levels (i.e., compared to the 1960s). In the 1960s, levels as low as 1 mg/L DO were reported. Trends examined showed that the annual minimum DO has been increasing since the 1970s and that levels low enough to impede upstream migration of Chinook have not been reported since the diversion from the river of the South Treatment Plant wastewater discharge in 1985.

The results for Year 2000 at Station 0309 (RM 6.75, freshwater) were between 8 and 11.8 mg/L and always met the Salmonid Rearing and Migration Criteria of 6.5 mg/L. At stations 0307 and 0305, results were more variable and indicate that there is still reason for concern. At station 0305, the results for May and December were 4.6 and 3.4 mg/L, respectively. For Station 0307, DO was 4.2 and 3.2 mg/L in January and December. There were also other sporadic instances where DO results were slightly below the relevant freshwater (6.5 mg/L) or saltwater (6.0 mg/L) criteria.

Fecal Coliform Bacteria

The limited data collected in 2000 at Stations 0309, 0307, and 0305 indicate that fecal coliform bacteria does not appear to be a water quality concern for the Duwamish Waterway. Of the sixty data points collected at these three stations for 2000, only one sample exceeded the freshwater secondary contact recreation criteria of 200 CFU / 100 mL. The May sample for station 0305 contained 300 CFU / 100 mL, but all other results ranged between 1 and 100 CFU/100mL. In addition, the enterocci marine criteria (70 CFU / 100 mL) for secondary contact recreation was only exceeded once at Stations 0305 and 0307 providing further evidence of compliance with water quality criteria. Fecal coliform bacteria were not assessed in the Habitat-Limiting Factors Report, but it may be assumed that the 2000 results represent an improvement from monitoring in previous decades because this waterway had numerous combined sewer outfalls in the past.

Turbidity, Ammonia, pH, Metals and Fecal Coliform

Turbidity results were always low (0.7-5 NTU) in 2000 at all three stations, with one exception at station 0307 in June, where 19 NTU was measured. Ammonia results were always low 0.01 to 0.08 mg/L and are not a concern. Similarly, pH was almost always between 6.5 and 8.5, with one result at station 0307 in June of 8.54. All of these results appear to meet applicable criteria and there is no reason to believe that these parameters represent significant water quality concerns. These parameters were not discussed in the Habitat-Limiting Factors Report (King County 2000).

Metals were not analyzed or not reported for the Year 2000 data set at these stations. The Habitat-Limiting Factors Report indicates that the factors described above (i.e., re-routing of wastewater effluent) that resulted in improvement in levels of DO in the

Duwamish Waterway have also resulted in lower discharges of metals to the Duwamish. Nevertheless, the Duwamish Waterway is on the State's 303(d) list of impaired waterways for various metals.

CRISP CREEK

Crisp Creek is a small tributary of the Green River located in the Middle Green River Watershed and enters the Green River at river mile 40. Monthly water quality data from stations F321 and O321 are available for most parameters in Year 2000 data set.

Temperature

The State's Noncore Salmon/Trout temperature criterion (17.5°C) was not violated in 2000 and the maximum temperature reported was 12.2°C at Station O321 in August. This appears to be an improvement over the 1996 to 1999 data, but a full comparison of these data are not possible because continuous results were available in 1998 and 1999, but only monthly readings are available for 2000. The 1996-1999 data contained several periods where the temperature of Crisp Creek were of concern (King County 2000). For example in 1998, there were 12 days in July and 17 days in August where the 17.5°C Noncore Salmon/Trout criterion was exceeded. There were also instances in September, April and May of 1999 where the proposed 12°C spawning criterion was exceeded. As noted in the Habitat-Limiting Factors Report (King County 2000), temperature is a possible factor of decline for salmonids in Crisp Creek.

Dissolved Oxygen

There were no violations of the Noncore dissolved oxygen criteria (8.0 mg/L) in 2000. The lowest dissolved oxygen in 2000 was 9.35 mg/L observed in August at Station O321 (below the Keta Creek Hatchery). The dissolved oxygen levels observed are similar to the 1996-1999 findings, which indicated that several results were below the proposed salmonid rearing criterion (10.5 mg/L) and that all results were above the 8.0 mg/L Class A criterion. The Habitat-Limiting Factors Report (King County 2000) concluded that dissolved oxygen may be a concern for salmonids in this stream; however that does not appear to be the case using the updated criteria.

Turbidity

The turbidity data for Stations F321 and O321 in 2000 is quite different even though the Stations are located only approximately 1 mile apart. Station F321 is located immediately upstream of the Keta Creek Hatchery and Station O321 is about a mile downstream. In 2000, the average NTU measurement at F321 was 1.1 and ranged from 0.6 to 3.3 NTU, whereas O321 had and average of 7.9 and ranged from 0.6 to 64 NTU. Even if the maximum value at 0321 is excluded, the average is still 4.6 NTU and was generally substantially higher and more variable than station O321. The 64 NTU reading at station O321 is the only measurement that exceeds the State's Noncore Salmon/Trout criteria of no more than 5 NTU greater than background and may be influenced by precipitation. The results for 2000 are similar to the 1996 to 1999 results (King County 2000), where one event violated criteria and could have potentially had negative effects on salmonids.

Ammonia and pH

Neither of these parameters exceeded the pertinent water quality criteria at either water quality station in 2000. Ammonia was consistently quite low (i.e., < 0.2 mg/L or not detected) and pH was generally around 7.5. This is consistent with results observed between 1996 and 1999, which also indicated that these parameters were not likely of concern in Crisp Creek.

Fecal Coliform Bacteria

Crisp Creek is listed on Washington State's 1998 303(d) list for fecal coliform bacteria. In 2000, fecal coliform concentrations at station F321 were consistently low and did not exceed the criterion for primary contact recreation. However, concentrations at station 0321 were much higher and always exceeded the primary contact recreational criteria (geometric mean of 100 colonies / 100 milliliters) between May and September. Fecal coliform levels in the monthly samples collected between May and September ranged between 110 and 910 colonies / 100 milliliters. Station O321 is located below the State Fish Hatchery. These data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

Metals were generally not detected in Crisp Creek and do not appear to be a water quality concern. Metals detected in Crisp Creek were always below the relevant total recoverable or dissolved hardness-adjusted water quality criteria. However, several metals (i.e., lead, mercury, selenium, and silver) had analytical detection limits that were slightly greater than the water quality criteria and compliance could not be determined. Metals data were collected only at station O321 and arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc were evaluated. This is consistent with previous years results (King County 2000), which also indicated that metals are not a water quality concern for Crisp Creek.

NEWAUKUM CREEK

Newaukum Creek is located near the City of Enumclaw and with headwaters at 5,000 ft near Boise Ridge. It flows into the Green River at approximately river mile 40.5. The headwaters are dominated by forestry activities, whereas the middle and lower watershed is dominated by agricultural and rural residential development. There are a total of 16 water quality monitoring stations on Newaukum Creek, thus a great deal of data and spatial information are available for this tributary. Newaukum Creek is listed on the State's 303(d) list of impaired waterbodies for fecal coliform bacteria, ammonia, and dissolved oxygen.

Temperature

The State's Noncore Salmon/Trout temperature criterion (17.5°C) was not violated during 2000 and the maximum temperature reported was 12.9°C at Station N322 on July 24. This appears to be an improvement over the 1996 to 1999 data, where a number of measurements were greater than 14.5°C and a maximum of 15.5°C was observed. However, because neither of these data sets contain continuous temperature monitoring results, it is possible that these results do not represent highest temperatures occurring at these stations.

Dissolved Oxygen

In 2000, data for most stations were in compliance with the 8.0 mg/L Noncore Criteria. However, at three stations (3 of 16 total) there were DO measurements that exceeded the 8.0 mg/L Noncore Criteria. Dissolved oxygen at Station AC322 ranged from 4.3 to 5.7 mg/L between June and July of 2000 and there were only three measurements in 2000 that were greater than 8.0 mg/L. At Station WH322 one measurement was 7.1 mg/L, and all other measurements ranged from 8 to 13.6 mg/L. Station AK322 also had two results that were slightly below the 8.0 mg/L Noncore criteria. This is similar to the 1996-1999 results, which also supported the 303(d) listing for dissolved oxygen.

Turbidity, pH and Ammonia

As concluded in the Habitat-Limiting Factors Report, turbidity also was not a concern for salmonids in Newaukum Creek in 2000. Turbidity measurements were generally low (1-4 NTU), and only occasional results were greater than 10 NTU. The maximum value observed in 2000 was 28 NTU at Station 0322 on February 1. All pH results were between 6.7 and 8.15, supporting the finding from the Habitat-Limiting Factors Report that pH is not likely a concern for salmonids.

Similarly, the ammonia results did not exceed the chronic water quality criterion in 2000. This is also similar to the findings of the Habitat-Limiting Factor Report, which indicated that ammonia did not exceed water quality criteria from 1996 and 1999. However, Newaukum Creek is listed on the 303(d) list of impaired water bodies for violations of the ammonia water quality criteria.

Fecal Coliform Bacteria

Newaukum Creek is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and continued violations of water quality criteria were observed in the 2000 data. Fecal coliform concentrations ranged from 1 to 16,000 CFU/100 mL and violations were observed at all stations. Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

Metals were generally not detected in Newaukum Creek and do not appear to be a water quality concern. Metals analyzed were always below the relevant total

recoverable or dissolved hardness-adjusted water quality criteria. However, several metals (i.e., cadmium, lead, mercury, selenium, and silver) had analytical detection limits were slightly greater than the water quality criteria so it was not possible to determine compliance. Copper was generally detected at station 0322, but dissolved results were always below water quality criteria by a factor of approximately 1.3 to 2. Because only four data points are available for 2000, and data are only available for one station, it is possible that copper may be a water quality concern at certain times of the year or in other reaches of Newaukum Creek. The Habitat-Limiting Factors Report concluded that metals were not a likely water quality concern for Newaukum Creek.

SOOS CREEK

Soos Creek and its major water bodies, Big Soos, Little Soos, Covington, and Jenkins Creeks, are north of the Green River and drain an urban and rural area of 70 square miles. All of these streams have similar physical characteristics with deep pools, slow velocities and drain relatively flat terrain that contains wetlands and multiple lakes. Various reaches in the Soos Creek Basin are on the State's 303(d) list for fecal coliform bacteria, dissolved oxygen and temperature.

Temperature

The State's Noncore Salmon/Trout temperature criterion (17.5°C) was not exceeded in Big Soos Creek or Covington Creek in 2000. The maximum temperatures in Big Soos Creek (16.4°C), and Covington Creek (16.2°C) were measured in July and August and did not violate State Criteria. However, maximum temperatures of 23°C were observed in Soosette Creek do violate the 17.5°C Noncore criteria. This not consistent with the 1996 to 1999 data, where a number of temperature measurements in Big Soos, Little Soos, Jenkins, Covington, and Soosette Creek exceeded the water quality criteria. The Habitat-Limiting Factors Report concluded that temperature was a likely factor of decline for salmonids in this watershed. Since the data examined in this text are only from one year, it is difficult to make conclusions about long-term trends.

Dissolved Oxygen

Big Soos, Little Soos and Soosette Creek are on the State's 303(d) list of impaired waterbodies for failing to meet the dissolved oxygen water quality criteria. This is supported by the data for 2000, which indicates that Big Soos Creek, Covington Creek and Little Soos Creek all had periods when dissolved oxygen was less than the 8.0 mg/L Salmonid Noncore Criteria. Big Soos Creek had minimum dissolved oxygen results of 4.7 mg/L in July. At stations in the upper reaches of Big Soos Creek (L320 and Q320), dissolved oxygen was less than the water quality criteria in all measurements from June to October. Covington Creek had minimum dissolved oxygen results of 8.3 mg/L in February, which is an unexpected result because this does not correspond to elevated stream temperatures. Similarly, Little Soos Creek had minimum results of 7.2 mg/L in June. This is similar to the 1996-1999 results, which also supported the 303(d) listing for dissolved oxygen. The Habitat-Limiting Factors Report also noted that many of the low dissolved oxygen results for Big Soos Creek, Little Soos Creek, Jenkins Creek, Covington Creek and Soosette Creek coincided with the defined salmonid incubation period.

Turbidity, pH and Ammonia

As concluded in the Habitat-Limiting Factors Report, turbidity does not appear to be a concern for salmonids in the Soos Creek subbasin in 2000. Turbidity measurements were generally low (1-4 NTU), and only occasional results were greater than 10 NTU. The maximum value observed in 2000 was 31 NTU in Big Soos Creek at Station A320 in November. All pH results were between 6.5 and 8.0, supporting the finding from the Habitat-Limiting Factors Report that pH is not likely a concern for salmonids.

Similarly, ammonia results were always less than the chronic water quality criterion. This is supported by the findings of the Habitat-Limiting Factor Report, which indicated that ammonia did not exceed water quality criteria from 1996 and 1999.

Fecal Coliform Bacteria

Soos Creek is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and continued violations of water quality criteria were observed in the 2000 data. Violations of the primary contact recreation criterion of 100 colonies / 100 mL were observed in all monitored streams. Fecal coliform concentrations ranged from 1 to 16,000 CFU/100 mL

and violations were observed at all stations. Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

Metals were only monitored in Big Soos Creek at Station A320 and were generally not detected. Hardness calculated from dissolved calcium and magnesium at this station was low and the mean hardness was 15 mg/L (as calcium carbonate). This calculation results in a low chronic water quality criteria for copper (2.2 ug/L), which was violated on June 12th when 2.7 ug/L dissolved copper was measured. There were no other water quality criteria violations. However, several metals (i.e., cadmium, lead, mercury, selenium, and silver) had analytical detection limits that were slightly greater than the water quality criteria so it was not possible to determine compliance. The Habitat-Limiting Factors Report concluded that metals were not a likely water quality concern for Soos Creek.

MILL CREEK

Mill Creek drains the plateau west of the Green River and starts from Lake Doloff and Lake Geneva and flows through the Peasley Canyon to its confluence with the Green River at approximately river mile 24. The plateau is largely residential, whereas the valley floor is a mix of commercial, industrial and agricultural uses. Mill Creek is on the State's 303(d) list of impaired water bodies for dissolved oxygen, fecal coliform bacteria and temperature. It was also designated as one of the most polluted streams in King County by the Green Duwamish Nonpoint Action Plan (King County 1989). In 2000, data were collected at only at Station A315. This station is located near the confluence with the Green River on the valley floor.

Temperature

The State's Noncore Salmon/Trout temperature criterion (17.5°C) was exceeded in August 2000, when a reading of 18.6°C was recorded. There were no other temperature exceedances. This is consistent with the 303(d) listing for temperature and the results of the Habitat-Limiting Factors Assessment. The Habitat-Limiting Factors Report noted that temperatures of up to 23.8°C were measured in June of 2000. Continuous data from

King County's stream gauge were evaluated in the Habitat-Limiting Factors Report and this report concluded that temperature was a probable factor of decline for salmonids in this stream.

Dissolved Oxygen

All dissolved oxygen measurements made between March and November were below the 8.0 mg/L Salmonid Noncore Criteria in 2000. Results ranged from 5.1 to 7 mg/L and minimum values corresponded to higher temperatures and the lowest values generally were observed in the summer months. However, the minimum value of 5.1 mg/L was measured in April and does not correspond to elevated stream temperatures. Regardless, this is similar to the 1996-1999 results, which also supported the 303(d) listing for dissolved oxygen and concluded that dissolved oxygen was a probable factor of decline for salmonids in this stream.

Turbidity, pH and Ammonia

Turbidity ranged from 3.9 to 33 NTU and was generally between 3.9 and 19 NTU in 2000. As concluded in the Habitat-Limiting Factors Report, turbidity does not appear to be a concern for salmonids. All pH results were between 6.6 and 7.3 in 2000, supporting the finding from the Habitat-Limiting Factors Report that pH is not likely a concern for salmonids. Ammonia measurements in 2000 were much lower than the chronic water quality criterion and this is consistent with the Habitat-Limiting Factor Report, which indicated that ammonia did not exceed water quality criteria from 1996 and 1999.

Fecal Coliform Bacteria

Mill Creek is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and continued violations of water quality criteria were observed in the 2000 data. Fecal coliform values ranged from 25 to 6,400 CFU/100 mL. This constitutes frequent violations of the primary contact recreation criteria (100 CFU / 100 mL). Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

Metals were generally not detected in 2000. Hardness calculated from dissolved calcium and magnesium at this station was low and the mean hardness was 17 mg/L (as calcium

carbonate). This results in a low chronic water quality criteria for copper (2.5 ug/L) and this was violated in February, June and November when between 2.6 and 4.9 ug/L dissolved copper was measured. The hardness-adjusted chronic criterion for lead (0.35 ug/L) was also violated in June when 0.48 ug/L dissolved lead were measured. There were no other metal criteria violations. However, several metals (i.e., cadmium, lead, mercury, selenium, and silver) had analytical detection limits that were slightly greater than the water quality criteria. The Habitat-Limiting Factors Report did not note any exceedances of water quality criteria for metals and concluded they were not a likely water quality concern for Mill Creek.

BLACK RIVER – SPRINGBROOK CREEK

The Black River previously drained Lake Washington and has undergone major changes since it was blocked (to provide flow for the Ballard Locks). Springbrook Creek is now the only major stream in this basin and drains an urban area. In 2000, water quality data were collected at Station 0317 on Springbrook Creek. Springbrook Creek is on the 303(d) list for dissolved oxygen, temperature, fecal coliform and metals (chromium, cadmium, copper, mercury and zinc).

Temperature

In 2000, the State's Noncore Salmon/Trout temperature criteria (17.5°C) was violated in August, when 20.4°C was measured; there were no other temperature violations. Similar results were observed in the Habitat-Limiting Factors Report, where occasional, but infrequent temperature excursions were observed and temperature was noted to be a possible factor in the decline of salmonids. This is consistent with the 303(d) listing for temperature.

Dissolved Oxygen

Dissolved oxygen results for 2000 ranged from 3.4 to 10.5 mg/L and all measurements made between April and December were below the 8.0 mg/L Salmonid Noncore Criteria. Minimum dissolved oxygen results were measured between July and October when results of 3.4 to 4.7 mg/L corresponded to higher water temperatures. This is

similar to the 1996-1999 results, which reported numerous exceedances of dissolved oxygen criteria and also supported the 303(d) listing for dissolved oxygen.

Turbidity, pH and Ammonia

Turbidity in 2000 ranged from 8 to 60 NTU and was generally between 15 and 30 NTU. All pH results were between 6.8 and 7.0, supporting the finding from the Habitat-Limiting Factors Report that pH is not likely a concern for salmonids. Ammonia results observed were much lower than the chronic water quality criterion in 2000 and this is consistent with the Habitat-Limiting Factor Report, which indicated that ammonia did not exceed water quality criteria from 1996 and 1999.

Fecal Coliform Bacteria

Springbrook Creek is listed on Washington State's 1998 303(d) list for fecal coliform bacteria and continued violations of water quality criteria were observed in the Year 2000 data. Fecal coliform concentrations ranged from 20 to 2,200 CFU/100 mL and frequently violated both the primary contact recreation criteria (100 CFU / 100 mL) and the secondary contact recreation criteria (200 CFU / 100 mL). Fecal coliform data were not evaluated in the Habitat-Limiting Factors Report (King County 2000).

Metals

Metals were generally not detected in 2000. Hardness calculated from dissolved calcium and magnesium at this station was low and the mean hardness was 17 mg/L (as calcium carbonate). This results in a low chronic water quality criteria for copper (2.0 ug/L) and this was violated in February, June and November when between 2.0 and 2.9 ug/L dissolved copper was measured and represented 3 of the 4 measurements for copper. The hardness-adjusted chronic criteria for lead (0.19 ug/L) was also violated in these months when between 0.22 and 0.55 ug/L dissolved lead were measured. There were no other water quality criteria violations. However, several metals (i.e., cadmium, mercury, selenium, and silver) had analytical detection limits that were slightly greater than the water quality criteria so it is not possible to draw conclusions regarding compliance. The Habitat-Limiting Factors Report did not note any water quality exceedances for metals and concluded that metals measured in 1996-1999 were not a concern, but also noted that Springbrook Creek is on the 303(d) list for multiple metals.