7. WATER QUALITY PROBLEMS ANALYSIS

This chapter analyzes the water quality information and problems identified in Chapter 4, Existing Conditions and Chapter 5, Identification of Problems. Each problem is described, and then a conceptual solution and rationale is presented. The water quality problems listed represent one or more of following: (1) a concern that a potential water quality problem exists at a particular location as reported in a questionnaire, in an "Service Response System" (SRS) entry, or by a member of the project team; (2) potential problems suggested by water quality monitoring results; and (3) field observations of erosion and sediment deposits in streams.

In 2003, the Washington State Department of Ecology (Ecology) released new State water quality standards. The standards are anticipated to be implemented in 2004 following approval by the U.S. Environmental Protection Agency. The biggest changes will be in the way that streams are classified (according of fish characteristics); the addition of temperature parameters to protect temperature-sensitive fish, such as bull trout and Dolly Varden; addition of a new indicator (enterococci) to measure bacteria in fresh water; and the addition of new values for ammonia in waters without salmon species. When the changes are finalized, the Mid-Puyallup tributaries will be reclassified under the new standards. Revisions to the stormwater/surface water monitoring program of Pierce County Water Programs will be required and the water quality problems in the Mid-Puyallup Basin can be reassessed.

7.1 Site-Specific Issues

Locations of the water quality problem sites can be seen on *Figure 5-2, Water Quality Problem Areas*, in Chapter 5.

7.1.1 Iron Bacteria in Alderton Creek, WQ-1

Problem Description

Iron bacteria in Alderton Creek proliferate in the open channel portion of the creek near the corner of Pioneer Way East and 88th Street East. Thick mats of the orange bacteria grow in the streambed during the summer at this location. The site is on the flat Puyallup valley bottom where the groundwater table is shallow. Much of Alderton Creek is fed by groundwater that has a high iron concentration. Water samples collected here in the summer of 2002 had dissolved iron levels of 40.8 milligrams per liter (mg/l). This is four times the typical levels of iron in groundwater and two orders of magnitude higher than the federal drinking water standard for iron (0.3 mg/l). Although the presence of iron bacteria is unsightly in Alderton Creek, it is neither toxic nor hazardous to public health.

Conceptual Solution

Dissolved metals can be removed from water by either fine filtration or flocculation methods. Both technologies are difficult to apply to a stream environment and are costly. Because the iron

bacteria in Alderton Creek present no public health hazard and they are present only during the warm summer months, costly cleanup for aesthetic reasons is difficult to justify. Therefore, it is recommended that no action be taken.

7.1.2 Commercial Landfill, WQ-2

Problem Description

A commercial sanitary landfill sits within the headwaters of Horsehaven Creek near Thun Field. The land operated as a gravel mine and landfill from 1967 to 1989. The landfill accepted liquids, solids, industrial wastes, and heavy metal sludges in addition to household garbage until 1985. Of the 92-acre landfill, 56 acres had no groundwater protection. This portion of the landfill was closed in 1989 and capped to prevent rainwater from draining into waste materials below. The remaining part of the landfill is lined and uses a leachate collection system. The entire landfill stopped accepting waste in 1998 and was capped by 2000.

An investigation of the landfill conducted in the early 1980s found that groundwater quality had been affected down gradient from the landfill. Underlying groundwater in the upper regional aquifer flows in a northwesterly direction toward Clover Creek. Contaminants included dissolved iron and manganese, chloride, ammonia, nitrate, sulfate, and low intermittent levels of volatile organic compounds including benzene, chlorobenzene, 1,1-dichloroethane, and 1,4-dichlorobenzene (Kleinfelder 2001). This site was placed on the National Priority List (Superfund) in April 1989. According to Tacoma-Pierce County Health Department, Source Protection Program staff, the deep aquifer flows east.

Cleanup operations continue in cooperation with Ecology. They consist primarily of methods that either: (1) prevent precipitation from penetrating the landfill cover and generating leachate; or (2) leachate pretreatment followed by discharge to the sewer lines of the Pierce County Wastewater Utility. Leachate is a solution resulting from the extraction of soluble materials by water or other liquids as they move through landfilled waste. Pretreatment reduces biological oxygen demand, metals and solids, and neutralizes pH so that treated liquids meet County sewer utility influent limits. Biological treatment takes place at the Chambers Creek Wastewater Treatment Plant. Liquids collected in the composting center

Stormwater runoff from the landfill cap collects in channels that lead to a retention pond where the runoff seeps into the ground. Water quality of the pond is tested on a regular basis by an independent contractor and reported to the Tacoma-Pierce County Health Department in accordance with State requirements.

Water quality monitoring has demonstrated an overall improvement in groundwater quality following implementation of these measures. Seventeen (17) groundwater monitoring wells of varying depth around the landfill are regularly tested. Water supply wells within 4,000 feet (3/4 mile) of the landfill provide drinking water to nearby communities. Regular monitoring of wells indicates that drinking water quality is typically within federal standards with sporadic exceedences of nitrate levels.

The SRS contained no complaints about water quality in the vicinity of the landfill. Contaminants associated with the landfill have not been found in the tributaries to Horsehaven Creek to date.

Conceptual Solution

The landowner, through an independent contractor, has conducted regular groundwater testing at monitoring wells around the landfill. Additional groundwater monitoring does not appear to be warranted. Benthic Index of Biotic Integrity (BIBI) sampling and analysis is the best indicator of stream health. BIBI sampling occurred in 2002 (see *Table 4-10* in Chapter 4) for Horsehaven Creek. BIBI sampling occurs in approximately five-year cycles. Periodic BIBI sampling of Horsehaven Creek and the tributary nearest the landfill will provide the best indicator of biological health of the stream over time. If BIBI scores start to fall, more specific water quality monitoring could be initiated. For a cost estimate for this solution, see Chapter 9, PRG-23-07.

7.1.3 Copper Contamination in Fennel Creek, WQ-3

Problem Description

In 1999, Foster Wheeler Environmental Corporation conducted an environmental analysis of the Fennel Creek corridor for the City of Bonney Lake. Grab samples were taken at five points along the stream for water quality analysis. Elevated levels of copper were detected at several sites. An investigation of likely sources found that an algaecide containing copper was being used in Debra Jane Lake upstream of the sampling sites. The practice has since been stopped. Pierce County sampled for copper again in 2002 and found concentrations had diminished greatly. No other metals, with the exception of a slight elevation of mercury at Site 1, exceeded State standards. Supporting data are shown in Section 4.8.2 of this Basin Plan. Sampling sites are shown on *Figure 4-13, Water Quality Sampling Sites*.

Copper concentrations within the bed sediments of the creek may be elevated; no sediment sampling has been done to confirm or deny this. The conditions under which metals resolubilize from attached sediments are dependent on pH, organic matter, level of aeration, and other factors. In this instance, it would be expected that resolubilization of copper would be low. Even if bed sediments are temporarily suspended during storm flows, the bonded copper would resettle with the sediment particles. Any copper in the bed sediments will eventually be transported downstream and out of the system.

Conceptual Solution

Recent sampling of Fennel Creek has demonstrated that the copper contamination present in the early 1990s is no longer an issue. No remedial actions are recommended.

7.1.4 Fish Hatchery and Rearing Facility –WQ-4

Problem Description

A commercial hatchery that produces Rainbow trout brood stock in addition to eggs is located roughly 0.8 mile upstream from the mouth of Canyon Falls Creek. Potential pollutants of concern from this type of facility include total suspended solids (TSS), biochemical oxygen demand (BOD_5), dissolved oxygen (DO), nutrients, and disease control chemicals. The hatchery is permitted under a General NPDES Permit for Upland Fin-Fish Hatching and Rearing Facilities. Ecology is responsible for ensuring compliance of the hatchery with water quality standards. Settling ponds to remove settleable solids are used to improve water quality prior to discharge.

Water samples collected by the Puyallup Tribe in Canyon Falls Creek downstream of the hatchery have not indicated water quality problems for monitored parameters related to hatcheries. Supporting data are presented in Section 4.8.2 of this Basin Plan. Sampling sites are shown on *Figure 4-13, Water Quality Sampling Sites*.

Conceptual Solution

Although regular water quality testing and reporting of discharge from the hatchery occurs, water quality downstream of the McCutcheon Road East culvert has not been regularly monitored. BIBI sampling and analysis is the best indicator of stream health and need only be performed once every three-to-five years. Placing Canyon Falls Creek downstream of the McCutcheon Road East culvert on a regular BIBI sampling schedule is recommended. If BIBI scores drop, more extensive water quality testing should be considered (Chapter 9, PRG-23-07).

7.1.5 Potential Untreated Sewage from Trailer Park

Problem Description

Residents in the vicinity of a trailer park at the easterly end of 176th Street East reported concern that the on-site sewer system associated with the address has failed and could be releasing untreated seepage into Horsehaven Creek. The location of this site is indicated on *Figure 5-2, Water Quality Problems*. The property is in an area designated rural by the County Comprehensive Plan.

The trailer park has been abandoned and is involved in litigation. The Tacoma-Pierce County Health Department has lead responsibility for on-site sewer systems.

Conceptual Solution

Report the concern to an environmental health officer at the Health Department and work with the Health Department to clean up sources of contamination..

7.2 Basin-Wide Issues

7.2.1 Failing On-Site Sewer Systems Above High Groundwater, WQ-5

Problem Description

Several citizens have complained that flooding has caused their on-site sewer systems to fail. The groundwater table is shallow in the Puyallup River Valley. Groundwater levels rise in the wet winter months and fall during the dry summer period. Land in this area has been designated rural and is mostly agricultural with nodes of urban and suburban intensity development. The combination of high groundwater and on-site sewer systems presents a potential for failed on-site sewer systems, but the extent of failed on-site sewer systems due to groundwater flooding or surface water flooding has not been examined.

Conceptual Solution

Investigate the extent to which reported failures of on-site sewer systems in the valley portion of the Mid-Puyallup Basin are related to groundwater flooding and surface water flooding.

7.2.2 Bank Erosion, WQ-6

Problem Description

Bank erosion along stream channels contributes to elevated turbidity levels, sediment accumulations, degraded habitat, and can cause other property damage. In agricultural areas such as the valley portion of the Mid-Puyallup Basin, lack of vegetated stream corridors expose stream banks to wind and rain, increasing their susceptibility to erosion. Allowing livestock access to streams damages stream banks. Livestock trample the banks and destroy vegetation. Citizens have reported that livestock continue to have access to Horsehaven Creek in some areas. Increased urban development also affects stream bank erosion by changing hydrology patterns and increasing erosive peak flows.

Figure 7-1
Examples of Degraded Stream Banks on Ball and Horsehaven Creeks

Three of the Mid-Puyallup tributaries—Alderton Creek, Ball Creek, and Horsehaven Creek—flow along the flat valley bottom and have unprotected stream banks through agricultural areas.

The low gradient of these creeks compounds the problem by making it difficult for sediments from bank erosion to be flushed downstream. All three of these creeks have thick layers of fine material covering their gravel beds and smothering spawning gravel. This fine sediment reduces the flow of oxygen rich water to developing eggs and fills cobble spaces where insects live that provide food for developing fingerlings.

An investigation into the primary sources of sediment on each of these streams would be beneficial in focusing restoration efforts most effectively. Reduction in sediment input is essential to stable restoration and long-term recovery of these streams for salmonid habitat. A study, ST-1, is recommended in Chapter 9 to obtain this information.

Conceptual Solution

Solutions to bank erosion overlap with solutions to several other water quality and habitat issues in this basin. These solutions include mitigating for increases in stormwater volume due to urban growth, planting streamside riparian areas, restricting livestock access to creeks, and educating the public about what is important for channel integrity. Stormwater mitigation (such as regional detention ponds, on-site facilities, or low impact development techniques) helps reduce hydrologic impacts from urbanization that can scour and damage stream banks. Programmatic recommendations PRG-23-01 and PRG-00-02 in Chapter 9 will help reduce urban impacts, which will reduce stream bank erosion. Vegetation along streams provides root structures that support bank integrity, limit livestock access to the stream and thereby prevent trampling of the banks, and provide a source of woody debris that can deflect flowing water from banks and increase channel complexity. Program PRG-00-05 described in Chapter 9 will provide for revegetating riparian corridors along the Mid-Puyallup tributaries. Limiting livestock access to creeks reduces bank erosion caused by trampling damage. Restricting livestock from creeks also helps to reduce fecal coliform bacteria levels in the creeks. Providing incentives and educating landowners adjacent to streams helps bring bank and stream protection to a local level and provides people with a sense of stewardship in their own backyard. Program PRG-00-06 described in Chapter 9 provides public education for this purpose.

7.2.3 Land Use Impacts, WQ-7

Problem Description

Land use impacts to water quality in the Mid-Puyallup Basin are primarily a result of historical agriculture use. Much of the Puyallup River Valley has been used for agriculture since the early 1900s and continues to be used this way today. Impacts to Mid-Puyallup tributary streams resulting from agriculture include elevated stream temperatures from lack of vegetated stream corridors; high fecal coliform levels from herd animals; and for herbicides and insecticides in the water. Elevated temperatures during the summer on both Ball Creek and Horsehaven Creek are addressed as part of WQ-8 below. Grab samples collected by the Puyallup Tribe found fecal

coliforms levels exceeding State standards six times during the years 1999 to 2001 in Fennel Creek and Canyon Falls Creek. The data are summarized in Section 4.8.2 of this Basin Plan.

The water quality of stormwater runoff from urban areas is an increasing concern in the Mid-Puyallup Basin as urban and suburban growth increases. Urban stormwater runoff typically has elevated levels of nutrients, metals, and fine sediment (Horner, et al. 1994) among others. As urban growth increases, water quality in local streams could be adversely affected unless the aspects of urban development that degrade water quality.

Some parts of the Mid-Puyallup Basin are planned for future growth that could more than double effective impervious area (EIA) in the contributing area. This is true in the northern headwaters of the Fennel Creek Basin, particularly within subbasins FC-2, FC-3, BL-3, and BL-4. In the Horsehaven Creek Basin, subbasins HH-1, HH-3, and HH-6 show that EIA more than doubles under future conditions, primarily along the Lorenz tributary. All subbasins contributing to Canyon Falls Creek show dramatic growth in the future. However, water quality is not expected to be affected from the proposed Cascadia Development, which covers much of the area, because no surface water will be released from the development site. Several subbasins that drain directly to the Puyallup River may also experience dramatic growth in the future, including D-2, D-3, D-4, D-8, D-9, D-14, D-17.

The unique topography of this basin (plateaus surrounding river valley) introduces issues of water interaction between the upper areas of the Basin and the flat river valley. The Horsehaven Creek Tributary Basin is a prime example of new urban development being constructed on the plateau above rural homes in the valley. Multiple springs emerge from the hillside between the plateau and the valley. The springs serve as water sources for the homes below. These springs are fed by infiltration up on the plateau. An increase in impervious surfaces on the plateau could affect both the quantity and quality of water from the springs. Impervious surfaces reduce the amount of infiltration feeding the springs. Infiltration ponds may not be the best solution because they concentrate infiltration to limited areas.

Conceptual Solution

Recommended solutions for land use impacts on water quality are the same as for protecting stream banks (Section 7.2.2) but with a different emphasis. In this case, mitigation for stormwater emphasizes providing water quality treatment along with detention to reduce the pollutant loads entering streams from urban and agricultural land uses (Chapter 9, PRG-23-01, PRG-23-02, and PRG-23-03). Planting stream corridors reduces sheet flow from lawns and compacted soils, and also provides some filtering to reduce pollutant loading (Chapter 9, PRG-23-05). Public education about water quality can help reduce pollution from lawn and garden maintenance, motor oil dumping, car washing, and domestic animal waste (Chapter 9, PRG-23-06). Regular water quality monitoring can provide feedback on the effectiveness of implemented programs (Chapter 9, PRG-23-07). In addition, Pierce County has been under a "Phase I" NPDES municipal permit since 1995. All other jurisdictions within the Basin will be issued permits from Ecology in 2005. Interlocal coordination and common requirements and standards for stormwater quality among the various jurisdictions should be pursued.

Currently, there is not enough information on the hydrologic interaction between the plateaus and the valley bottom. ST-4 described in Chapter 9 would fill this information gap and help engineers and policy makers better determine the most appropriate mitigation of problems within this unique area.

7.2.4 Elevated Temperatures, WQ-8

Problem Description

Elevated temperatures have been recorded in several Mid-Puyallup Basin tributaries, notably Ball Creek, Fennel Creek, and Horsehaven Creek. Creeks that flow through pastures and have no riparian corridor to provide shade commonly have summer time water temperatures that exceed the State water quality standards. In the summers of 2001 and 2002, temperatures were measured above the standard (18^{o}C for "Class A" waters) in several Mid-Puyallup Basin tributaries both by field measurements and by permanently mounted recording stations. Field measurements taken during August 2001 were 18.2^{o}C in Ball Creek and 19.3^{o}C in Horsehaven Creek. The day and time of these measurements were not targeted to obtain the highest temperature reading. The permanent monitoring stations on Fennel Creek and Horsehaven Creek recorded summer high temperatures of 21.3^{o}C and 21.4^{o}C respectively for summer 2002. No permanent monitoring equipment was available on Ball Creek. The data are summarized in Section 4.8.2 of this Basin Plan.

During 2002, Ball Creek was proposed to be listed on the State's 303(d) list of impaired waters for both temperature and fecal coliforms.

Conceptual Solution

The key element in maintaining water temperature is to maintain or create a vegetated riparian corridor that shades the stream. Riparian corridors are difficult to restore in many areas because much of the creek property in the Mid-Puyallup Basin is private. In many areas along these creeks, the lot sizes are large, so participation from even just a few landowners could have a substantial benefit. Program PRG-00-05 recommended in Chapter 9 provides for restoration of riparian vegetation that will provide shade and lower summertime stream temperatures.

7.2.5 Trash Dumping, WQ-9

Problem Description

Although specific trash laden sites along streams were found during the basin characterization, the potential for dumping trash into streams exists throughout the basin. Trash in streams is not only unsightly; it also poses a hazard to fish and other aquatic creatures that can become trapped in the debris. Public health can also become a concern depending on the nature of what is discarded.

Conceptual Solution

Pierce County Responds is a County program which aims to reduce illegal dumping and its adverse health effects. Components of the program include: support for neighborhood cleanups

and adopt-a-road or park volunteer programs; a hotline to report illegal dumping and public nuisance junk vehicles; a public education program with resource guides to where recyclables and other waste can be taken; assistance to those who want help in removing junk vehicles; and legal action against the owners of the worst sites.

Three aspects of the Responds program may be particularly useful for helping to clean-up trash and other illegally dumped items in streams:

1. Assistance to individual property owners;

2. Support for neighborhood volunteer clean-up of a particular site; or

3. Long-term support for volunteer adopt-a-stream programs under the guidance of the Pierce Conservation District's Stream Team.

Under the first and second options, property owners or neighborhood volunteers may apply for a one-time credit where they supply the labor to clean-up a property and the County arranges to cover up to $100 of the disposal costs. Under the third option, volunteers working with the Stream Team adopt a stream and agree to clean-up a length of stream a specified number of times a year. The County arranges for pick-up and disposal of the waste.

For junk vehicles abandoned in streams, the County has a number of options for working with property and vehicle owners to get the vehicles removed. More information can be found on the Pierce County Responds Hotline (253) 798-4636, or go to the Responds website at www.piercecountyresponds.org.

7.2.6 Fecal Coliform Bacteria, WQ-10

Problem Description

Fecal coliform bacteria enter streams and other waters from the feces of animals. Allowing cattle to have free access to streams elevates fecal coliform levels and can pose health risks to both humans and fish. Elevated fecal coliform levels have been recorded in several of the Mid-Puyallup tributaries. The data are provided in Section 4.8.2 of this Basin Plan. In 2002, Ball Creek was proposed to be listed on the State's 303(d) list for both fecal coliform and temperature.

Conceptual Solution

Reducing and eliminating fecal sources is the best way to reduce fecal coliform in any water body. Restricting livestock access to the streams will provide a large reduction. Program PRG-00-05 described in Chapter 9 would help restrict livestock access by restoring riparian vegetation and where necessary installing fencing.