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DEPARTMENT OF ECOLOGY

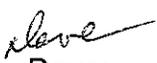
MAR 13 2008

WATER QUALITY PROGRAM

March 11, 2008
WP54979

Dave Peeler 
Department of Ecology
PO Box 47600
Olympia, Washington 98504

SUBJECT: Celebrating the Water Quality Successes at South Prairie Creek


Dear Dave:

As you know, it's a rare occasion in our business when we get to savor and declare success. I, for one, see an opportunity at South Prairie Creek to do that and I hope you will join me. I am asking you to take time to join me in celebrating success by moving the relevant stream segments at South Prairie Creek into Category 1 on the state's 303d list and by jointly proclaiming victory for the Total Maximum Daily Load (TMDL) program.

Enclosed is a most recent report evaluating over two years of water quality monitoring data that shows we have achieved some critical goals for South Prairie Creek for fecal coliform reductions and that stream is now in compliance with State Water Quality Standards. And that the load allocations of the South Prairie Creek TMDL have been met.

How often can we say that?

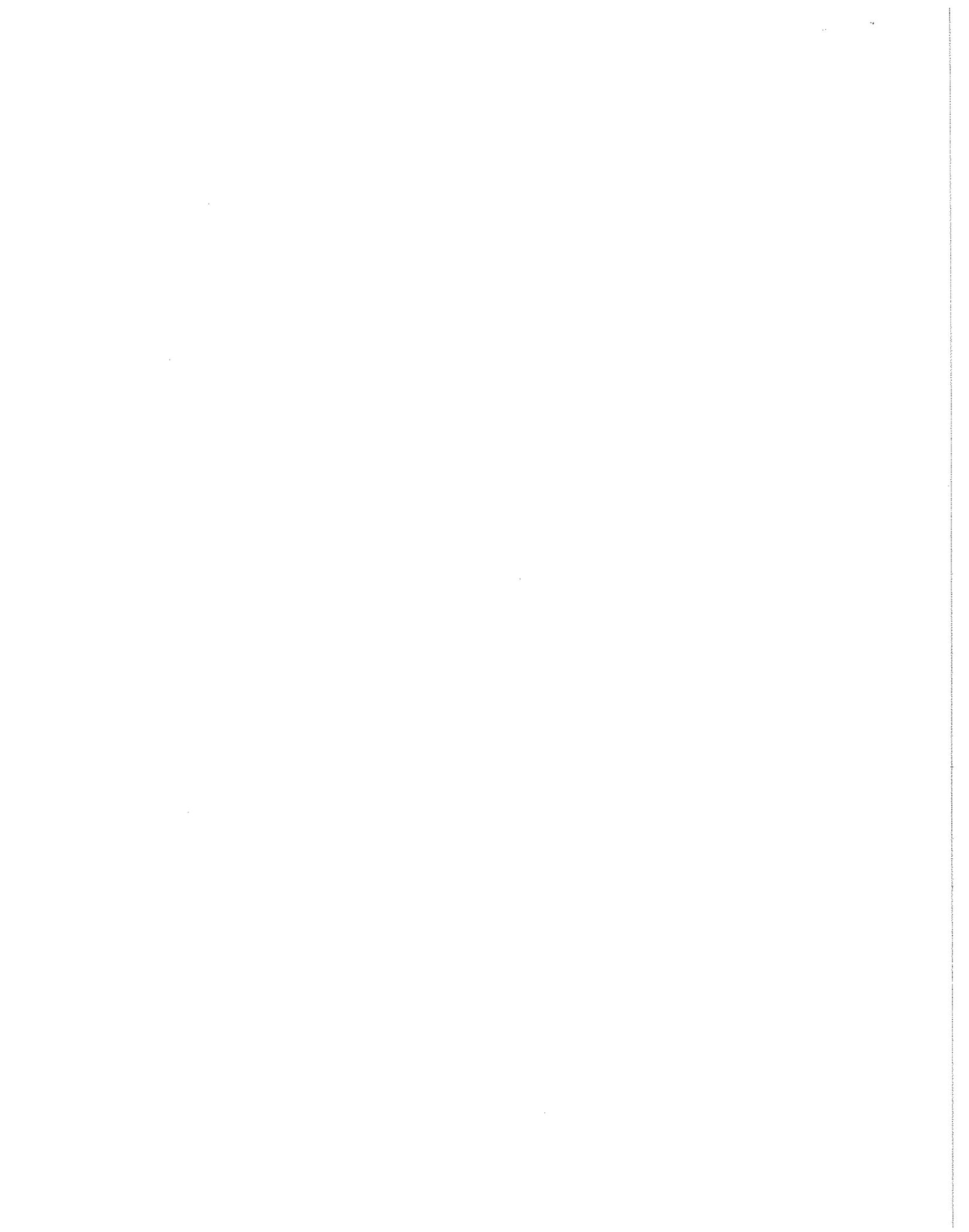
Have we ever been able to say that?

Summary of South Prairie Creek Monitoring Results and Evaluation (TIM # 134064, Brown and Caldwell for Pierce County Water Programs, January 14, 2008)

In the enclosed report, I asked Brown and Caldwell to:

1. Compare recent monitoring results with load reductions in the South Prairie Creek TMDL.
2. Compare those monitoring results with State Water Quality Standards.





3. Compare actual load reductions with load reductions projected in April 2005 (Pierce County Work Order # D053-000-1, BC Project No. 25986, enclosed).

The following are the highlights of this evaluation:

1. Over two years monitoring data (2005-07) were evaluated.
2. 90 samples were taken and available for analysis (compared with 30 WDOE samples used to list the stream in 2000-01).
3. The 2005-07 sampling was conducted pursuant to WDOE grant and a WDOE-approved Quality Assurance Plan.
4. The results qualify a couple of segments for movement to Category 1, Meets Tested Criteria, per WQP Policy 1-11.
5. The actual load reductions exceed the TMDL's Waste Load Allocation.
6. Actual load reductions are within the range projected by Watershed Treatment Model (April 2005).

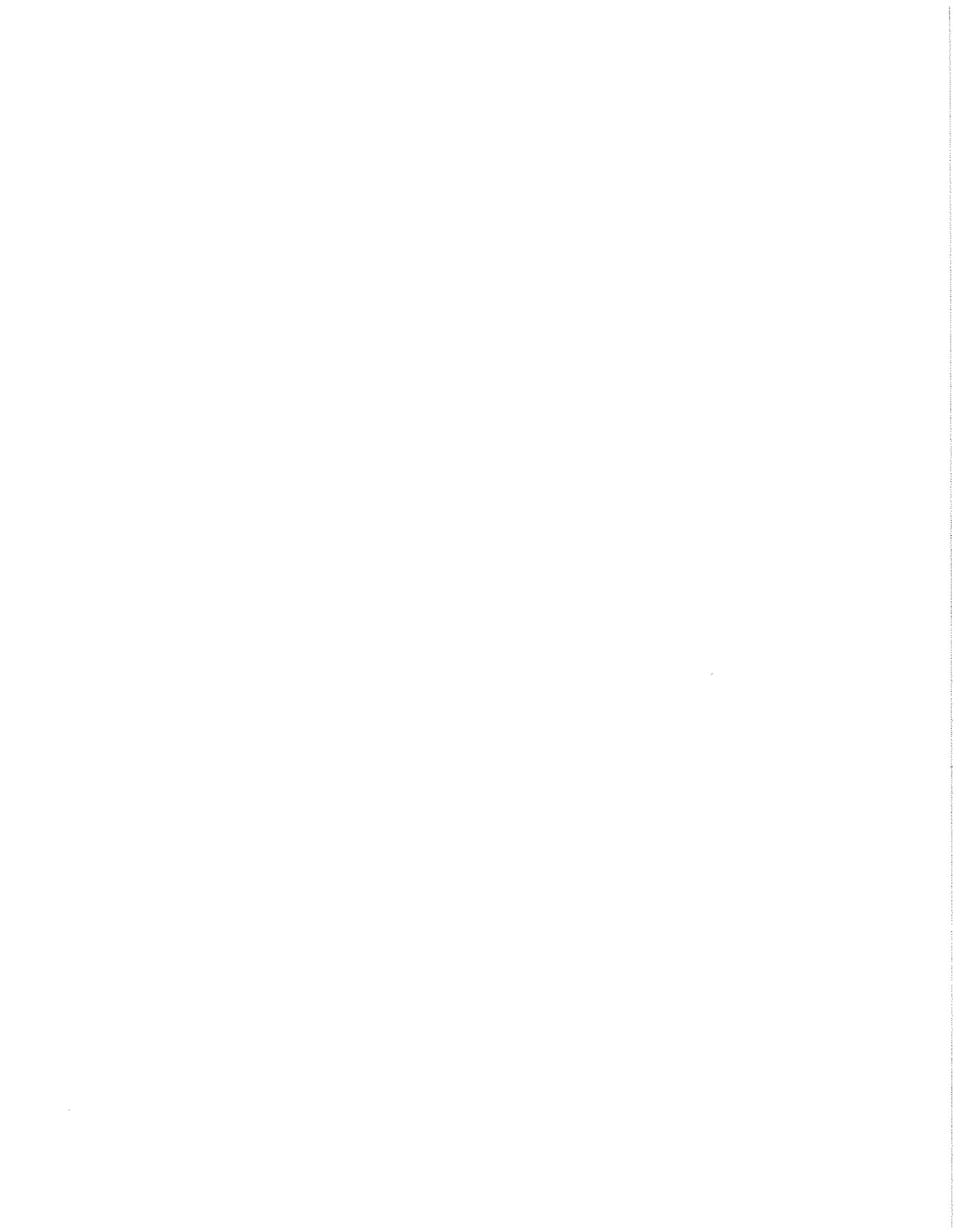
In summary, this evaluation concludes "*...both mainstem reaches downstream of the dairy site appear to have met the state standards for fecal coliform bacteria and are therefore eligible for removal from the state's list of "polluted" waters....*" (page 2).

Process for Celebrating Success

Fact is, Pierce County is very proud that our efforts to buy these floodplain properties, decommission pollutant-generating sources, and manage them for multiple benefit, have resulted in the river achieving compliance with water quality standards. I hope the Department of Ecology also takes pride in the fact that working with the local community through its TMDL process, that we have collectively achieved some of our water quality goals for the stream.

I propose we celebrate this success by:

1. Ecology specifically attributing South Prairie Creek TMDL / WQS success to Pierce County in one or more of the following manners:
 - a. moving the applicable mainstem segments to Category 1 (for fecal coliform) on the 303d List as part of the state's current 2008 water quality assessment; and
 - b. sending a letter to Pierce County declaring County compliance with the South Prairie Creek TMDL for fecal coliform at the mainstem segments; or



- c. approving the floodplain acquisition as a successful cap and trade or effluent trade on South Prairie Creek.
2. Ecology and Pierce County preparing a joint press release between Ecology and Pierce County on the water quality successes to date on South Prairie Creek.
3. Ecology and Pierce County jointly host a public meeting in the South Prairie Creek area communicating the water quality successes to date on South Prairie Creek.
4. Jointly participating in an Ecology Program Management Team / Executive Management Team, Legislative Hearing, Puget Sound Partnership or other forum communicating the water quality successes to date on South Prairie Creek.
5. Jointly participating in an assessment of how the acquisition of floodplain properties and decommissioning of pollutant sources can be a tool other local governments can use to meeting TMDL load and wasteload allocations.
6. Jointly participating in regional and national conferences on the effectiveness of acquisition and pollutant-source decommissioning as viable TMDL strategies for local government, including the Pacific Northwest Clean Water Association's annual conference, September 2008, in Kennewick, and the American Water Resources Association's annual meeting in New Orleans, November 2008.
7. Others.

Too often, we fail to recognize success when we get there. This is a case where we all knew intuitively that public acquisition of this prime salmonid stream and removing a large pollutant-generating source with past administrative order history was a good thing. Now we have the data to back that up.

You can reach me at 253.798-4672 to start the celebration.

Sincerely,



Dan D. Wrye
Watershed Services Manager

Enclosures:

1. South Prairie Creek Monitoring Results and Evaluation (TIM # 134064, Brown and Caldwell for Pierce County Water Programs, January 14, 2008).
2. Fecal Coliform Load from Inglin Dairy (Pierce County Work Order # D053-000-1, BC Project No. 25986), Memo to Dan Wrye, April 15, 2005.

cc: File
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MAR 13 2008



Technical Memorandum

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Prepared for: Pierce County
Project Title: Carbon River Basin Plan Phase 2
Project No: 134064

South Prairie Creek Monitoring Data Evaluation Technical Memorandum

Date: January 14, 2008
To: Pierce County
From: Mike Milne, Project Manager

Prepared by: Liz Korb, Engineer
Reviewed by: Justin Twenter, Engineer

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Limitations:

This document was prepared solely for Pierce County in accordance with professional standards at the time the services were performed and in accordance with the contract between Pierce County and Brown and Caldwell. This document is governed by the specific scope of work authorized by Pierce County, it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by Pierce County and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness or accuracy of such information.

1. EXECUTIVE SUMMARY

This memorandum describes Brown and Caldwell's (BC's) evaluation of water quality samples collected near the Inglin Dairy site in Pierce County, Washington. The primary purpose of the evaluation was to determine whether the recent elimination of the dairy operation has reduced fecal coliform bacteria concentrations in South Prairie Creek downstream of the dairy site. BC performed the evaluation in accordance with Task 7 in the Scope of Work for the Carbon River and Upper Puyallup Basin Plan Phase 2 (Pierce County Work Order No. DO10-016-2)

The Scope of Work for BC's evaluation specified three objectives:

1. Identify apparent water quality improvements that may be attributable to the County's recent acquisition and restoration of the Inglin Dairy site that supports attainment of the South Prairie Creek TMDL wasteload allocation
2. Identify any South Prairie Creek stream reaches that may be eligible for removal from the state 303(d) list of "polluted" waters, based on recent water quality data.
3. Compare the observed load reductions to those previously estimated by BC using the Watershed Treatment Model (WTM)

BC found the following results for each objective:

1. The two mainstem monitoring sites just downstream of the Inglin Dairy site had significantly lower fecal coliform concentrations during 2005-2007, after the dairy was removed.
2. Based on sampling conducted during 2005-2007, both mainstem reaches downstream of the dairy site appear to have met the state standards for fecal coliform bacteria and are therefore eligible for removal from the state's list of "polluted" waters. Tributary T1 did not always meet standards during 2005-2007
3. The fecal coliform load reductions observed after dairy closure are consistent with the WTM predictions.

2. BACKGROUND

The Inglin Dairy site is located on South Prairie Creek just downstream of the town of South Prairie (Figure 1). A small tributary (T1) flows through the dairy property and enters South Prairie Creek in the eastern part of the site. The T1 sub-basin encompasses approximately 400 acres of unincorporated land. Although Tributary T1 is not part of either Pierce County or Washington State Department of Transportation's (WSDOT) storm drainage system, it is the pathway by which stormwater covered by Pierce County and WSDOT's National Pollutant Discharge Elimination System (NPDES) permits reaches South Prairie Creek.

Water quality sampling conducted in the early 1990s indicated that South Prairie Creek often exceeded the state water quality standards for fecal coliform bacteria. Consequently, in 1996, the Washington State Department of Ecology (Ecology) listed South Prairie Creek as an "impaired" water body under Section 303(d) of the federal Clean Water Act. The Clean Water Act requires that a Total Maximum Daily Load (TMDL) must be established for each "impaired" water body on the 303(d) list when technology-based

controls are not sufficient. Ecology therefore issued a TMDL for fecal coliform bacteria in South Prairie Creek and Tributary T1 in 2003. The TMDL was based on monitoring data collected by Ecology during 2000-2001.

In April 2005, the Pierce County Department of Public Works and Utilities, Water Programs asked BC to estimate the potential fecal coliform load reductions associated with the elimination of the Inglin Dairy operation. BC used the Watershed Treatment Model (WTM) to estimate the potential load reductions (Caraco 2001). The WTM estimated that the annual fecal coliform bacteria load from the Inglin Dairy (when it was operating) ranged from roughly 112,000 billion to 1,500,000 billion colonies per year, or about 300 to 4,000 billion colonies per day. Based on these results, BC concluded that eliminating the dairy land use would cause substantial reductions in fecal coliform loads in the creek downstream of the dairy and in Tributary T1, which passes through the dairy site (Brown and Caldwell 2005). Ecology's TMDL submittal report (Ecology 2003) notes that Tributary T1 originates in the town of South Prairie and conveys groundwater and stormwater to South Prairie Creek. Land use in the upper portion of the T1 sub-basin is moderately dense residential development with some commercial, and land use in the lower portion is agricultural with limited rural residential (Ecology 2003).

Pierce County Water Programs helped purchase the Inglin Dairy in early 2005 to improve water quality in South Prairie Creek. All livestock were removed from the property at that time. The former Inglin Dairy site is now known as the South Prairie Creek Preserve and the County is restoring the site using native plants.

Ecology issued the Draft South Prairie Creek Bacteria and Temperature Total Maximum Daily Load Detailed Implementation Plan in March 2006. The Implementation Plan predicted that acquisition of the dairy would substantially reduce bacteria loads. The plan states:

This acquisition will undoubtedly be the single most important implementation action to affect the bacterial quality of South Prairie Creek and eliminates direct livestock access to South Prairie Creek. Fecal coliform inputs and loading between the Tributary 1 and Tributary 1-Inglin Dairy sampling locations will be significantly reduced as dairy livestock will no longer be grazing in the pastured area through which Tributary 1 flows.

It is assumed that the vast majority of fecal coliform pollution in South Prairie Creek will be eliminated by the removal of the Dairy herd from the former Inglin Dairy (September 2003), and that the creek, downstream of the former dairy, may now be meeting water quality standards for fecal coliform. Monthly fecal coliform monitoring beginning in May, 2005, will evaluate this assumption.

The Pierce Conservation District (PCD) led the "post-dairy" water quality monitoring program, which began in May 2005 and ended in October 2007. The "post-dairy" monitoring was conducted by PCD in accordance with an Ecology-approved Quality Assurance Project Plan (Ragland and Roberts 2005). As shown in Figure 1, the program included several locations near the Inglin Dairy site.

3. EVALUATION OBJECTIVES AND APPROACH

The Scope of Work for BC's evaluation specifies three objectives:

1. Identify apparent water quality improvements that may be attributable to the County's recent acquisition and restoration of the Inglin Dairy site that supports attainment of the South Prairie Creek TMDL wasteload allocation.
2. Identify any South Prairie Creek stream reaches that may be eligible for de-listing based on recent water quality data.

- 3 Compare the observed load reductions to those previously estimated by BC using the WIM

To meet these objectives, BC completed the following steps:

- Selected monitoring locations to be included in the evaluation.
- Performed statistical analyses to determine whether the “post-dairy” fecal coliform bacteria concentrations were significantly lower than the concentrations observed while the dairy was still in operation.
- Compared the “post-dairy” fecal coliform bacteria concentrations to the state water quality standards
- Compared the observed changes in fecal coliform bacteria loads to the changes estimated using the WIM

3.1 Selection of Monitoring Locations

BC reviewed the Ecology and PCD monitoring programs to identify sampling locations that: 1) receive runoff from the Inglin Dairy site and 2) were sampled during both the 2000-2001 and the 2005-2007 studies.

The evaluation includes the following three sampling locations:

1. T1ID- Located at the mouth of the ditch (Tributary T1) from South Prairie
2. SPCID- Located at Inglin Dairy bridge
3. SPCB4- Located at the Route 162 bridge crossing just downstream of Inglin Dairy

T1ID and SPCID are located within the dairy site. Thus, they do not capture all drainage from the property. SPCB4 is located about 0.5 mile downstream of the dairy site. Any runoff from the property should flow past this location. However, SPCB4 also receives runoff from areas downstream of the dairy site

3.2 Evaluation of Water Quality Trends over Time

BC first calculated the following basic statistics for monitoring data collected from the selected stations during 2000-2001 and 2005-2007:

- Geometric mean
- 90th percentile
- Coefficient of variation

The standard formulas for these statistics from Microsoft Excel were used.

The Wilcoxon Rank Sum (WRS) test was then used to evaluate whether apparent differences between the 2000-2001 and 2005-2007 fecal coliform bacteria concentrations at each location are statistically significant. The WRS test is a statistical test that compares two independent groups of data to determine if one group contains larger values than the other. The WRS test was used instead of the t-test because the WRS test is a nonparametric test, meaning (unlike the t-test) no data distribution is assumed for the groups of data being tested.

The rank sum test then checks for two hypotheses (the null versus the alternative). The hypotheses for these analyses are based on a one-tailed test being used. A one-tailed test looks for an increase or decrease in the parameter whereas a two-tailed test looks for any change in the parameter (which can be any change— increase or decrease). The null hypothesis for the test is “the median of the 2005-2007 fecal coliform data is

not significantly different than the median of the 2000-2001 fecal coliform data.” The alternative hypothesis is “the median of the 2005-2007 fecal coliform data is lower than the median of the 2000-2001 fecal coliform data.”

3.3 Evaluation of Potential “De-listing”

The federal Clean Water Act Section 303(d) requires that every 2 years Ecology must identify all water bodies that do not support their designated beneficial uses, as indicated by water quality standards excursions. The resulting list of “impaired” or “polluted” waters is called the “303(d) list.” Prior to 2002, all water bodies in Washington were either listed as “impaired” or not listed at all. In 2002, Ecology developed a more comprehensive system for classifying water bodies. The 2002 system involves five Water Quality Assessment Categories, which are defined below.

1. **Category 1: Meets tested standards for clean waters.** Placement in this category does not necessarily mean that a water body is free of all pollutants. Most water quality monitoring is designed to detect a specific array of pollutants, so placement in this category means that the water body met standards for all the pollutants for which it was tested. Specific information about the monitoring results may be found in the individual listings.
2. **Category 2: Waters of concern** is for waters where there is some evidence of a water quality problem, but not enough to require production of a TMDL at this time. There are several reasons why a water body would be placed in this category. A water body might have pollution levels that are not quite high enough to violate the water quality standards, or there may not have been enough violations to categorize it as impaired according to Ecology’s listing policy. There might be data showing water quality violations, but the data were not collected using proper scientific methods. In all of these situations, these are waters that will continue to be tested.
3. **Category 3: No data** is a category that will be largely empty. Water bodies that have not been tested will not be individually listed, but if they do not appear in one of the other categories, they are assumed to belong here.
4. **Category 4: Polluted waters that do not require a TMDL** is for waters that have pollution problems that are being solved in one of three ways.
 - a. **Category 4a** is for water bodies that have approved TMDLs in place that are actively being implemented.
 - b. **Category 4b** is for water bodies that have a plan in place that is expected to solve the pollution problems. While pollution control plans are not TMDLs, they must have many of the same features and there must be some legal or financial guarantee that they will be implemented.
 - c. **Category 4c** is for water bodies impaired by causes that cannot be addressed through a TMDL. These impairments include low water flow, stream channelization, and dams. These problems require complex solutions to help restore streams to more natural conditions.
5. **Category 5: Polluted waters that require a TMDL.** Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan in place; thus, TMDLs are required for the water bodies in this category. Category 5 is equivalent to the pre-2002 303 (d) lists.

South Prairie Creek was included on the state’s 303(d) list of “polluted” (Category 5) water bodies because it violated the state water quality standards. According to the state water quality standards (WAC 173-201A),

fecal coliform concentrations in South Prairie Creek must not exceed a geometric mean value of 100 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

In 2006, Ecology issued a Detailed Implementation Plan for the South Prairie Creek bacteria TMDL. As noted above, Category 4a is for water bodies with approved TMDLs that are actively being implemented.

Ecology's Water Quality Program Policy 1-11 (Ecology 2006b) indicates that a water body that had been listed as "impaired" or "polluted" (Category 5) can be removed from the list when at least 10 samples during a calendar year (or a shorter critical period if defined by Ecology) show no exceedances beyond the criteria. However, the data used for "de-listing" must be based on a sampling effort that is comparable to the sampling used to support the original listing, and the sampling effort must target the critical periods in which exceedances of the criteria are more likely to occur (Ecology 2006b).

Therefore, BC evaluated the 2005-2007 monitoring program to confirm its comparability to the monitoring used to support the listing. BC then calculated the geometric means and the percentages of samples exceeding 200 colonies/100mL, and compared these results to the water quality standards described above.

3.4 Comparison to WTM Predictions

The WTM analysis performed by BC in 2005 estimated the range of annual fecal coliform loads from the Inglin Dairy. Ecology's 2000-2001 and PCD's 2005-2007 sampling efforts included grab sampling and analysis to determine fecal coliform bacteria concentrations, but neither study included sufficient flow data to calculate loads that could be directly compared to the WTM load estimates.

Therefore, BC performed a qualitative comparison based on the average streamflow data from U.S. Geological Survey (USGS) gage 12095000 (South Prairie Creek at South Prairie, Washington) for the two monitoring periods. The USGS gage is about 2 miles upstream from the dairy site.

4. RESULTS

4.1 Water Quality Trends

BC used the sampling results to calculate the geometric mean, 90th percentile value, and coefficient of variation for these three stations. Table 1 lists the geometric mean and 90th percentile for both data sets and their percent changes as well as their statistical significance.

Monitoring Site	GeoMean			90th Percentile			Statistically Significant Change
	2000-2001	2005-2007	% Change	2000-2001	2005-2007	% Change	
SPCB4	411	30	-93%	411	135	-67%	Yes ¹
SPCID	65	31	-53%	245	136	-45%	Yes ²
T1ID	600	95	-84%	1843	474	-74%	Yes ²

¹ Based on 1-sided Wilcoxon Rank Sum test with a confidence interval (α) of 0.05

² Insufficient data from 2000-2001 to use the same Wilcoxon rank sum test so exact test was used

As shown in Table 1, the geometric mean and 90th percentile appeared to drop substantially at all three monitoring stations. The largest apparent decreases were at Tributary T1.

The WRS test was then used to determine whether the apparent differences are statistically significant. There are two versions of the WRS test: the exact test and the large-sample approximation. If the size of the smaller sample of the two groups being compared does not exceed 20 and the size of the larger sample does not exceed 40, the exact version of the WRS test is used. Otherwise, the large-sample approximation version of the test is appropriate. SPCB4 was sampled 20 times during 2000-2001 and 30 times during 2005-2007, so the large-sample version of the test was used to analyze the data from that location. SPCID and T1ID were sampled only six times during 2000-2001 and 30 to 31 times during 2005-2007, so the exact test was used at those locations.

The null hypothesis for the large-sample test is "the median fecal coliform concentration from the 2005-2007 samples is not significantly different than the median from 2000-2001 samples." The alternative hypothesis is "the median of the 2005-2007 samples is lower than the median of the 2000-2001 samples." The samples from both data sets were then ranked together (any ties were accounted for). Using both the NORMSINV function from Microsoft Excel and Table A1- Cumulative Normal Distribution (Gilbert 1987), 1.645 was determined as the one-sided $Z_{1-\alpha}$ value. A confidence interval (α) of 0.05 was used. Two methods (Equation 18.9 [Gilbert 1987] and Statistica) were used to verify the value of Z_{rs} (the rank sum Z value). Both methods use the large sample approximation methods since both data sets have more than 10 samples. Both methods determined a Z_{rs} value of approximately -2.2. Because $Z_{rs} \leq Z_{1-\alpha}$, the null hypothesis is rejected and the alternative hypothesis is accepted. Thus, the statistical analysis found that the fecal coliform concentrations at SPCB4 were significantly higher in 2000-2001, when the Inglin Dairy was operational, than they were in 2005-2007, after the dairy had closed.

The null and alternative hypotheses for the exact test are the same as for the large-sample test described above. A confidence interval (α) of 0.05 was also used. The samples from both data sets were then ranked together (any ties were accounted for). The U' value is calculated using equation 8.45 (Zar 1999). The critical value, $U_{critical}$, was obtained from Table B-11 in Zar (1999). Because $U' \leq U_{critical}$ for both SPCID and T1ID, the null hypothesis is accepted at both monitoring locations. Thus, the statistical analysis found that the fecal coliform concentrations at SPCID and T1ID were significantly higher in 2000-2001, when the Inglin Dairy was operational, than they were in 2005-2007, after the dairy had closed.

4.2 Water Quality De-listing

Ecology's 2000-2001 sampling program, which was used to confirm the 303(d) listing and support development of the bacteria TMDL, involved 18 monthly grab samples at SPCB4 and 6 grab samples at SPCID and T1ID. PCD's 2005-2007 sampling program was conducted under a Quality Assurance Project Plan approved by Ecology. As shown in Table 2 below, the PCD program included 30 to 31 monthly grab sampling events at each of the three locations. Therefore, the 2005-2007 sampling results appear sufficient to help determine whether the reaches of South Prairie Creek and Tributary T1 met the applicable water quality standards.

The water quality standards applicable to South Prairie Creek and Tributary T1 state that fecal coliform concentrations must not exceed a geometric mean value of 100 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100 mL. The samples exceeding 100 colonies/100 mL are bolded in Table 2.

Table 2 shows that SPCB4 and SPCID had geometric mean fecal coliform concentrations less than the state standard of 100 colonies/100 mL, and less than 10 percent of the samples exceeded 200 colonies/100mL.

Thus, the reaches of South Prairie Creek associated with SPCB4 and SPCID met the state water quality standards for bacteria during the post-dairy sampling period. The geometric mean fecal coliform concentration at T1ID was less than the state standard of 100 colonies/100 mL; however, more than 10 percent of the samples collected at T1ID exceeded 200 colonies/100 mL, so Tributary 1 did not appear to meet the state standard during 2005-2007.

Table 2. Fecal Coliform Bacteria Data for 2005-2007 Monitoring

SBCB4		SBCID		T1ID	
Date	Fecal Coliform (colonies/100mL)	Date	Fecal Coliform (colonies/100mL)	Date	Fecal Coliform (colonies/100mL)
5/17/2005	5	5/16/2005	40	5/16/2005	1,000
		6/13/2005	21	6/13/2005	220
6/14/2005	31	6/14/2005	19	-	-
7/19/2005	23	7/18/2005	47	7/18/2005	320
8/29/2005	125	8/29/2005	103	8/29/2005	96
9/19/2005	55	9/19/2005	96.7	9/19/2005	145
10/18/2005	40	10/17/2005	51	10/17/2005	120
11/14/2005	14	11/14/2005	9	11/14/2005	29
12/12/2005	21	12/12/2005	19	12/12/2005	119
1/17/2006	6	1/17/2006	8	1/17/2006	46
2/13/2006	3	2/13/2006	12	2/13/2006	189
3/13/2006	<1*	3/13/2006	5	3/13/2006	95
4/17/2006	6	4/17/2006	4	4/17/2006	24
5/15/2006	23	5/15/2006	9	5/15/2006	40
6/12/2006	51	6/12/2006	28	6/12/2006	46
7/17/2006	40.5	7/17/2006	32	7/17/2006	26
8/14/2006	38	8/14/2006	40	8/14/2006	36
9/18/2006	172	9/18/2006	172	9/18/2006	18
10/16/2006	288	10/16/2006	244	10/16/2006	276
11/13/2006	37	11/13/2006	72.5	11/13/2006	25.5
12/11/2006	37	12/11/2006	11	12/11/2006	47
1/17/2007	7	1/17/2007	16	1/17/2007	38
2/12/2007	10	2/12/2007	15	2/12/2007	29
3/12/2007	45	3/12/2007	42	3/12/2007	248
4/16/2007	6	4/16/2007	6.5	4/16/2007	52
5/16/2007	12.5	5/16/2007	31	5/16/2007	61
6/11/2007	71	6/11/2007	61	6/11/2007	77
7/16/2007	108	7/16/2007	59	7/16/2007	2,360
8/13/2007	99	8/13/2007	71	8/13/2007	74
9/18/2007	162	9/17/2007	564	9/17/2007	2,020
10/16/2007	46	10/15/2007	45	10/15/2007	109
Number of Samples	30		31		30
Geometric Mean (colonies/100 mL)	30		31		95
% samples > 200 colonies/100 mL	3%		6%		23%

* This sample was below the detection limit of 1 colony/100 mL. A value of 1 was used for the statistical analysis.

4.3 Load Comparison

Calculating bacteria loads for a given time period (e.g., year or day) requires flow measurements for that time period. However, flows were measured at the sample locations during only a few of the 2000-2001 and 2005-2007 sampling events.

The USGS operates a flow gage (1209500) approximately 2 miles upstream of the Inglin Dairy site. BC used the flow data from this gage, together with the bacteria data listed in Table 2 above, to estimate “daily” bacteria loads at SPCB4 and SPCID. No loads could be computed for the T11D sampling site due to lack of flow data. Table 3 lists the average daily streamflow on the monitoring dates.

Table 3 Streamflow from USGS Gage 1209500			
Monitoring Dates 2000-2001	Streamflow (cfs)	Monitoring Dates 2005-2007	Streamflow (cfs)
7/19/2000	64	5/17/2005	538
8/1/2000	57	6/14/2005	179
8/21/2000	48	7/19/2005	80
9/5/2000	62	8/29/2005	55
9/19/2000	64	9/19/2005	34
10/24/2000	123	10/18/2005	88
1/29/2001	109	11/14/2005	399
2/27/2001	77	12/12/2005	147
3/26/2001	250	1/17/2006	995
4/16/2001	206	2/13/2006	217
5/22/2001	185	3/13/2006	141
6/18/2001	221	4/17/2006	267
7/9/2001	89	5/15/2006	144
8/20/2001	40	6/12/2006	179
9/17/2001	41	7/17/2006	60
10/15/2001	131	8/14/2006	36
11/29/2001	476	9/18/2006	40
12/18/2001	724	10/16/2006	126
		11/13/2006	829
		12/11/2006	338
		1/17/2007	193
		2/12/2007	166
		3/12/2007	1420
		4/16/2007	168
		5/16/2007	106
		6/11/2007	150
		7/16/2007	75
		8/13/2007	79
		9/18/2007	59
		10/16/2007	68

Table 4 lists the summary statistics for the daily streamflow data listed in Table 3. It shows that annual flows were greater for the 2005-2007 monitoring dates

Table 4. Streamflow Statistics from USGS Gage 1209500		
Statistic	Streamflow (cfs)	
	2000-2001	2005-2007
Median	99	146
Average	165	246
90th Percentile	318	567

Tables 5 and 6 list the estimated “daily” bacteria loads at the South Prairie Creek sampling locations. “Daily” loads were calculated for each day that a fecal coliform sample was collected. The “daily” loads were calculated using the fecal coliform concentration for each sample and the average daily flow measured at the USGS gage on the sampling date. The “daily” values should be regarded as very rough estimates because they are based on single grab samples collected approximately once per month; fecal coliform bacteria concentrations in a stream can vary by several orders of magnitude during a single day. Moreover, the flows used to estimate the loads were measured at the USGS gage (1209500) about 2 miles upstream of SPCB4 and SPCID. The median, average, and 90th percentile values listed in Tables 5 and 6 were calculated based on all of the “daily” loads for each site.

Table 5. Estimated Daily Fecal Coliform Loads at SPCB4		
Statistic	Billion Colonies / Day	
	2000-2001	2005-2007
Median	192	84
Average	433	204
90th Percentile	1,191	350

Table 6. Estimated Daily Fecal Coliform Loads at SPCID		
Statistic	Billion Colonies / day	
	2000-2001	2005-2007
Median	257	91
Average	399	242
90th Percentile	875	752

As shown in Tables 5 and 6, the estimated daily loads for 2005-2007 appear to be considerably lower than the estimated daily loads for 2000-2001. The average of the estimated daily loads for 2005-2007 was about one-half of the average for 2000-2001, even though flows in 2005-2007 were considerably higher (Table 4). As previously discussed, “daily” loads could not be estimated for T1 due to lack of flow data.

The average daily load at SPCB4 was about 200 billion fecal coliform colonies per day lower and the 90th percentile was about 900 billion colonies/day lower during 2005-2007 than during 2000-2001, despite the higher flows during 2005-2007. The average daily load at SPCID also appeared to drop considerably but the 90th percentile did not drop as dramatically as the SPCB4 monitoring site. This difference may be due to the relatively small number of samples collected at SPCID. The WTM analysis in 2005 estimated that the Inflin

Dairy could have contributed from 300 to 4,000 billion fecal coliform colonies per day. Thus, the observed load reductions are consistent with the load reductions predicted by the WTM.

5. CONCLUSIONS

Fecal coliform bacteria concentrations in South Prairie Creek downstream of the dairy site decreased significantly after the dairy was closed. Samples collected after dairy closure show that South Prairie Creek adjacent to and downstream of the dairy site met the state water quality standards for bacteria. Therefore, these reaches of the creek appear to meet the criteria for removal from the state's 303(d) list of impaired or polluted waters.

Fecal coliform concentrations in Tributary T1 appear to have declined since the dairy was closed. More than 10 percent of the samples collected at T1 after the dairy closed exceeded 200 colonies/100 mL. Therefore, T1 did not meet the state water quality standards for bacteria during 2005-2007.

Review of available streamflow data suggests that daily bacteria loads in 2005-2007 were about half the daily loads in 2000-2001, even though flows during 2005-2007 were considerably higher than during 2000-2001. The observed fecal coliform load reductions are consistent with the load reductions predicted by the WTM in 2005.

The South Prairie Creek TMDL listed target load reductions during the growing and the non-growing seasons. Ecology used the "statistical rollback method" (Ott, 1995) to determine the necessary reduction for both the geometric mean and 90th percentile bacteria concentration to meet the applicable water quality standard. Compliance with the most restrictive of the dual fecal coliform criteria determines the bacteria reduction needed. Ecology analyzed the 2000-2001 monitoring results and determined that meeting the standards would require a proportionately greater reduction in the 90th percentile (rather than the geometric mean). Therefore, the target TMDL load reduction for each site was calculated based on the difference between the observed 90th percentile concentration and the state standard (i.e., 200 colonies/100 mL).

Table 7 presents a summary of the geometric mean and the 90th percentile for the growing and the non-growing seasons at the three monitoring sites. This table shows that the SPCB4 and SPCID sites met the TMDL targets and state water quality standards during 2005-2007, after the dairy had closed. Tributary T1, which receives drainage from the town of South Prairie and agricultural areas upstream of the dairy site, did not meet the TMDL target or state water quality standards during 2005-2007.

Table 7. Summary					
			SPCB4	SPCID	T11D
Geomean	Growing Season	2000-2001 Samples	92	78	583
		2005- 2007 Samples	51	55	134
		TMDL Target: Geomean	54	57	61
		Was TMDL Target Met in 2005-07?	Yes	Yes	No
	Non Growing Season	2000-2001 Samples	44	*	*
		2005- 2007 Samples	12	13	57
		TMDL Target: Geomean	17	36	48
		Was TMDL Target Met in 2005-07?	Yes	Yes	No
90th Percentile	Growing Season	2000-2001 Samples	339	290	1915
		2005- 2007 Samples	183	185	808
		TMDL Target: 90 th Percentile	200	200	200
		Was TMDL Target Met in 2005-07?	Yes	Yes	No
	Non Growing Season	2000-2001 Samples	494	*	*
		2005- 2007 Samples	39	37	158
		TMDL Target: 90 th Percentile	200	200	200
		Was TMDL Target Met in 2005-07?	Yes	Yes	No
Met WQ Standard during 2005-2007?			Yes	Yes	No

* Insufficient data

6. REFERENCES

Brown and Caldwell. 2005. Letter to Dan Wrye entitled *Fecal Coliform Load from Inglin Dairy*. Pierce County Work Order # D053-000-1, BC Project No. 25986.

Caraco, D. 2001. *The Watershed Treatment Model*. Center for Watershed Protection, Ellicott City, MD

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Ragland, I and M. Roberts. 2004. *Quality Assurance Project Plan For South Prairie Creek Restoration Monitoring*. Pierce Conservation District. Centennial Clean Water Grant No. G0500118

Washington State Department of Ecology. 2006a. *South Prairie Creek Detailed Implementation Plan*. Publication Number 06-10-018

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Zar, J H. 1999. *Biostatistical Analysis*. New Jersey: Prentice Hall.

April 15, 2005

DEPARTMENT OF ECOLOGY

Mr. Dan Wrye
Pierce County Water Programs
9850 64th Street West
University Place, WA 98467-1078

MAR 13 2008
WATER QUALITY PROGRAM

Subject: Fecal Coliform Load from Inglin Dairy (Pierce County Work Order # D053-000-1, BC Project No. 25986)

Dear Dan:

As you requested, Brown and Caldwell (BC) performed pollutant loads modeling to estimate the potential fecal coliform load from the former Inglin Dairy to South Prairie Creek and from the unincorporated portion of the Tributary T1 subbasin, which enters South Prairie Creek at the Inglin Dairy site. We understand that the results may help you evaluate the potential load reductions associated with eliminating livestock use of the dairy property.

Background

The Inglin Dairy site is located on South Prairie Creek just downstream of the town of South Prairie. A small tributary (T1) flows through the dairy property and enters South Prairie Creek in the eastern part of the property. The T1 sub-basin encompasses approximately 400 acres of unincorporated land. While T1 is not part of either Pierce County's or WSDOT's storm drainage system, it is the pathway by which stormwater covered by Pierce County's and WSDOT's NPDES permits reaches South Prairie Creek.

The Washington State Department of Ecology (Ecology) recently established a Total Maximum Daily Load (TMDL) for fecal coliform bacteria in South Prairie Creek and tributary T1. Ecology identified the Inglin Dairy as a potential source of the elevated fecal coliform concentrations they observed in South Prairie Creek and T1. Ecology's TMDL submittal report (page 21) notes that waste from 46 cows would be sufficient to cause the load increases Ecology observed in South Prairie Creek near the dairy. The TMDL report noted that manure was routinely sprayed onto the dairy property adjacent to the creek and tributary T1 (Ecology 2003).

To help address the TMDL requirements and improve water quality in South Prairie Creek, Pierce County Water Programs has purchased the Inglin Dairy. The dairy has been decommissioned and the site will be restored using native plants and salmonid habitat restoration will be undertaken. A pre-existing underground manure storage tank will be entombed. Livestock are not now and will no longer be present at the site. Pierce County has ensured that deed restrictions have been placed on the property prohibiting unrestricted animal access to surface waters and retention of stormwater onsite. Thus, the

County's partnership in acquisition of the dairy could substantially reduce fecal coliform inputs to lower South Prairie Creek and tributary T1.

Approach

BC used the Watershed Treatment Model (WTM) version 3.1 to develop the fecal coliform load estimate for the Inglin Dairy. The WTM was developed in 2001 by the Center for Watershed Protection under an EPA grant.

To perform the analysis, we had to make a number of assumptions regarding the livestock population and manure management procedures at the Inglin Dairy. We obtained information about the Inglin Dairy operation from Mike Baden at the Pierce Conservation District (PCD). We obtained information about fecal output and attenuation rates from the WTM documentation and other published literature. The key assumptions are summarized in Table 1 below:

Table 1. Key Assumptions for Inglin Dairy Watershed Treatment Model

Assumption	Basis or Source
Animal population = 700 animal units @1,000 lbs each	Mike Baden, PCD (4/2005)
Cows were in barn 95% of time	Mike Baden, PCD (4/2005)
~2/3 of manure generated in barn was sprayed onto pasture; remaining 1/3 was hauled off site	Mike Baden, PCD (4/2005)
Manure was stored in ~30,000 gallon tank and sprayed onto fields; storage time generally less than 1 week	Mike Baden, PCD (4/2005)
Annual fecal coliform output per cow, high estimate: 2.63*E+13	American Society of Agricultural Engineers (1998)
Annual fecal coliform output per cow, low estimate: 1.971*E+12	Metcalf & Eddy (1991)
35% of fecal coliform in manure generated outside barn reaches creek	WTM default value (CWP 2001)
10% of fecal coliform sprayed on pasture reaches creek	WTM value for effectiveness of infiltration practices (CWP 2001)
Unincorporated portion of T1 Sub-basin = 394 acres	Pierce County GIS
Land uses in T1 sub-basin = 172 acres urban, 69 acres agriculture, 68 acres forest, 80 acres vacant, 5 acres open space	Pierce County GIS
Unincorporated portion of T1 sub-basin includes 36 septic systems	Estimated based on Pierce GIS land use data

Results

Based on the assumptions listed above, the WTM estimated that the annual fecal coliform load from the Inglin Dairy ranged from roughly 112,000 billion per year to 1,500,000 billion per year, or about 300 to 4,000 billion per day. These loads would result in creek

concentrations on the order of 50 to 700 colonies/100 mL, based on the median annual flow in South Prairie Creek. The WTM estimated that the fecal coliform load from the entire T1 sub-basin excluding the dairy is about 7,000 billion/year. Please refer to the attached spreadsheet for the details regarding the WTM analysis.

Discussion

As noted above, Ecology's TMDL report stated that 46 cows would be sufficient to account for the fecal coliform increases observed in lower South Prairie Creek during 2000-2001. Data provided by the Pierce Conservation District indicate that the dairy housed approximately 700 animal units. About 2/3 of the manure generated at the dairy during periods of confinement was disposed of on-site via spraying (personal communication with Mike Baden, Pierce Conservation District, April 2005). South Prairie Creek and the lower reach of tributary T1 flow directly through the dairy property. Thus, when the dairy was in full operation, it disposed of large quantities of manure in close proximity to the receiving water bodies.

Ecology sampled South Prairie Creek just below the dairy (station SPCB4) 20 times during 2000-2001. The geometric mean and 90th percentile concentrations at SPCB4 were 92 colonies/100 mL and 340 colonies/100 mL during the growing season and 74 colonies/100 mL and 865 colonies/100 mL during the non-growing season, respectively (Ecology 2003).

Based on the WTM and the median annual flow in South Prairie Creek, the dairy may have contributed on the order 50 to 700 colonies/100 mL to the creek. These concentrations are high relative to the concentrations observed in the creek by Ecology in 2000-2001, which suggests that the dairy could have accounted for much of the fecal coliform observed in South Prairie Creek at SPCB4. If so, eliminating the dairy land use should cause substantial reductions in fecal coliform loads in the creek downstream of the dairy. Elimination of the dairy should also result in substantially lower fecal coliform concentrations in tributary T1, which passes through the dairy site.

As shown in Figures 1 and 2, the Inglin Dairy fecal coliform load was probably far larger than the load from the unincorporated portion of the T1 sub-basin. Thus, from a pollutant trading perspective, eliminating the dairy should greatly exceed Pierce County's fecal coliform wasteload reduction responsibility.

Figure 1. South Prairie Creek Fecal Coliform Loads (High Output/Cow)

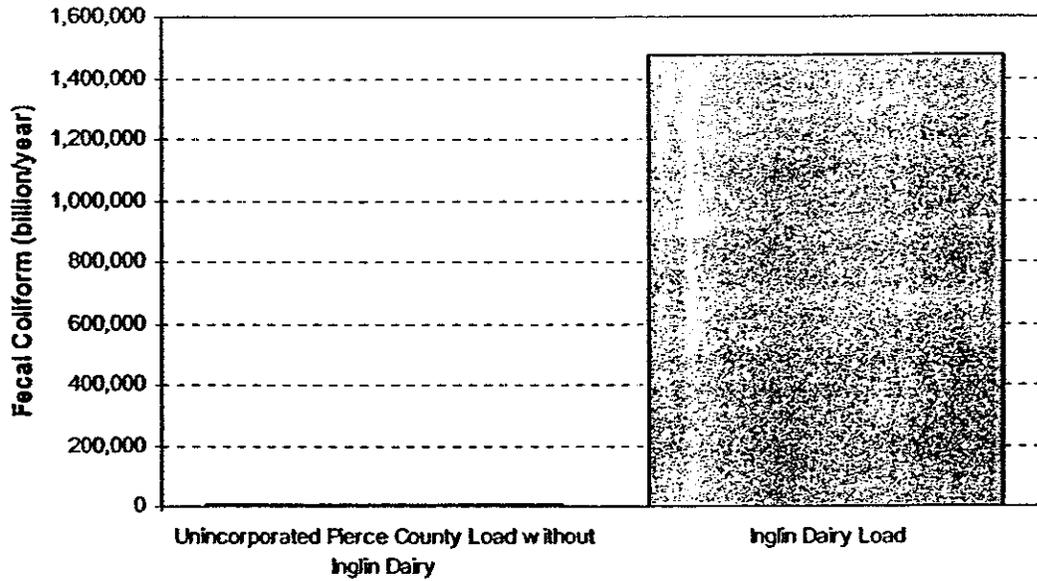
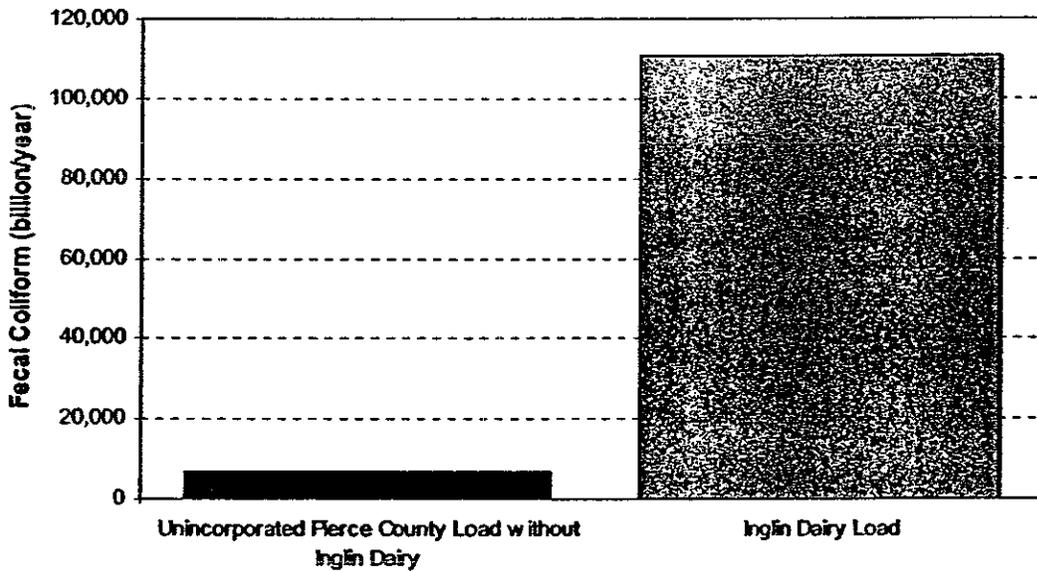


Figure 2. South Prairie Creek Fecal Coliform Loads (Low Output/Cow)



It is interesting to note that the "Target Geo-Means" prescribed in Tables 4 and 5 in Ecology's TMDL submittal report are well below the state water quality standard. For example, the target geo-mean for South Prairie Creek below the dairy during the non-growing season is 17 colonies/100 mL; the state standard is 100. The target geo-means

are lower than the state standard because (1) Ecology's "statistical rollback" procedure assumes that the current relationship between the geo-mean and the 90th percentile fecal coliform concentrations at each site will remain the same in the future, and (2) at most sites, the 90th percentile target was more restrictive (i.e., would require greater reductions in fecal concentrations) than the geo-mean target.

References

- American Society of Agricultural Engineers. 1998. *ASAE Standards, 45th edition: Standards, Engineering Practices, Data*. St. Joseph, MI.
- Baden, Mike. 2005. Natural Resource Specialist, Pierce Conservation District. Personal communication, April 2005.
- Center for Watershed Protection. 2001. *The Watershed Treatment Model*. Prepared for USEPA Region V.
- Metcalf and Eddy. 1991. *Wastewater Engineering: Treatment, Disposal, and Reuse*. McGraw-Hill, Inc. New York, N.Y.
- Washington State Department of Ecology. 2003. *South Prairie Creek Bacteria and Temperature Total Maximum Daily Load (Water Cleanup Plan) Submittal Report*. Publication No. 03-10-055.

I hope this meets your needs. Please e-mail or call if you have questions or need more information.

Sincerely,

Michael Milne
Project Manager

Enc.

Consistency of Pierce County Water Quality Trade with US EPA's Policy on Water Quality Trading (Office of Water, Water Quality Trading Policy, January 13, 2003)

The Pierce County Water Quality Trade at Inglin Dairy meets US EPA's water quality trading policy's following objectives:

- *"Achieves early reductions and progress towards water quality standards pending development of TMDLs for impaired waters.*
- *Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed.*
- *Reduces the cost of compliance with water quality-based requirements.*
- *Achieves greater environmental benefits than those under existing regulatory programs. EPA supports the creation of water quality trading credits in ways that achieve ancillary environmental benefits beyond the required reductions in specific pollutant loads, such as the creation and restoration of wetlands, floodplains and wildlife and/or waterfowl habitat.*
- *Secures long-term improvements in water quality through the purchase and retirement of credits by any entity.*
- *Combines ecological services to achieve multiple environmental and economic benefits, such as wetland restoration or the implementation of management practices that improve water quality and habitat."*

Additionally, Pierce County's water quality trade is consistent with specific EPA policy statements on trading:

EPA Water Quality Trading Policy Statement: Trading Areas. *All water quality trading should occur within a watershed or a defined area for which a TMDL has been approved. Establishing defined trading areas that coincide with a watershed or TMDL boundary results in trades that affect the same water body or stream segment and helps ensure that water quality standards are maintained or achieved throughout the trading area and contiguous waters.*

Consistency of Pierce County Trade: The Pierce County water quality trade is within the watershed, at the specific site, and on the specific waterbody of the TMDL.

EPA Water Quality Trading Policy Statement: Pollutants and Parameters Traded. *EPA supports trading that involves nutrients (e.g., total phosphorus and total nitrogen) or sediment loads. In addition, EPA recognizes that trading of pollutants other than nutrients and sediments has the potential to improve water quality and achieve ancillary environmental benefits if trades and trading programs are properly designed. EPA believes that such trades may pose a higher level of risk and should receive a higher level of scrutiny to ensure that they are consistent with water quality standards. EPA may support trades that involve pollutants other than nutrients and sediments on a case-by-case basis where prior approval is provided through an NPDES permit, a TMDL or in the context of a watershed plan or pilot trading project that is supported by a state, tribe or EPA.*

Consistency of Pierce County Trade: The Pierce County water quality trade is for fecal coliform and is part of the South Prairie/Carbon River Basin Plan for surface water management in the watershed.

EPA Water Quality Trading Policy Statement: *Baselines for Water Quality Trading.* As explained below, the baselines for generating pollution reduction credits should be derived from and consistent with water quality standards. The term pollution reduction credits ("credits"), as used in this policy, means pollutant reductions greater than those required by a regulatory requirement or established under a TMDL.

Consistency of Pierce County Trade: The Pierce County water quality trade is derived from current water quality standards. However, the TMDL assumes a compliance level 30% below (i.e., more conservative/protective) than applicable standards. Even so, the trade affords a significantly higher load reduction (as much as 100X) than would be required by regulation and established under a TMDL.

EPA Water Quality Trading Policy Statement: *When Trading May Occur.* TMDL Trading. Trades and trading programs in impaired waters for which a TMDL has been approved or established by EPA should be consistent with the assumptions and requirements upon which the TMDL is established. EPA encourages the inclusion of specific trading provisions in the TMDL itself, in NPDES permits, in watershed plans and the continuing planning process. EPA does not support any trading activity that would delay implementation of a TMDL approved or established by EPA or that would cause the combined point source and nonpoint source loadings to exceed the cap established by a TMDL.

Consistency of Pierce County Trade: The Pierce County water quality trade is specifically a TMDL Trade. Pierce County would incorporate the Trade into its South Prairie/Carbon River Basin Plan which is part of its NPDES continuing planning process. Approval of the Pierce County Trade will facilitate and accelerate, rather than delay, TMDL implementation.

EPA Water Quality Trading Policy Statement: *When Trading May Occur.* Alignment with the CWA. Provisions for water quality trading should be aligned with and incorporated into core water quality programs. EPA believes this may be done by including provisions for trading in water quality management plans, the continuing planning process, watershed plans, water quality standards, including antidegradation policy and, by incorporating provisions for trading into TMDLs and NPDES permits.

Consistency of Pierce County Trade: The Pierce County water quality trade is effectuated by Pierce County Water Programs, the local agency responsible for administering the County's NPDES municipal stormwater permit and thus is specifically incorporated into the County's core water quality program. Additionally, incorporating the Trade into the South Prairie/Carbon River Basin Plan, the TMDL is included in the capital facilities and long range program of the County.

EPA Water Quality Trading Policy Statement: *When Trading May Occur.* Incorporating Provisions For Trading Into Permits. In some cases, specific trades may be identified in NPDES permits, including requirements related to the control of nonpoint sources where appropriate. EPA also supports several flexible approaches for incorporating provisions for trading into NPDES permits: i) general conditions in a permit that authorize trading and describe appropriate conditions and restrictions for trading to occur, ii) the use of variable permit limits that may be adjusted up or down based on the quantity of credits generated or used; and/or, iii) the use of alternate permit limits or conditions that establish restrictions on the amount of a point source's pollution reduction obligation that may be achieved by the use of credits if trading occurs. EPA also encourages the use of watershed general permits, where appropriate, to establish pollutant-specific limitations for a group of sources in the same or similar categories to achieve net pollutant reductions or water quality goals through trading. Watershed permits issued to point sources should include facility specific effluent limitations or other conditions that would apply in the event the pollutant cap established by the watershed permit is exceeded.

For storm water runoff other than agriculture, EPA recommends monitoring or modeling to estimate pollutant loads and load reductions. EPA believes this may be based on local hydrology and actual data or pollutant loading factors that relate land use patterns, percent imperviousness or percent disturbed land and controls or management practices in a watershed to per acre or per unit pollutant loads, where other methods are not specified in a permit or regulation.

Consistency of Pierce County Trade: The Pierce County water quality trade can be incorporated into its NPDES stormwater permit, which is currently up for renewal. That permit is a watershed based stormwater permit. The Trade results more than account for the wasteload allocation as well as load allocations in the area. The Trade has been specifically modeled using EPA-approved loading models (Watershed Treatment Model) and is based on local hydrology, actual data, land use patterns, and other methods, consistent with this policy statement.

Exhibit C

Seller does not convey and expressly reserves all right, title, and interest to the following water rights: Certificate of Surface Water Right recorded in Volume No. 5, Page 2313, priority date October 4, 1945, for diversion and use of 0.4 cubic feet per second from South Prairie Creek for irrigation purposes; and Certificate of Surface Water Right No. S2-22850C, priority date June 27, 1974, for irrigation of 40 acres.

Subject to the foregoing reservation of water rights, Seller conveys together with said "Property" the following appurtenant water rights: Certificate of Surface Water Right recorded in Volume No. 22, Page 10963, priority date January 6, 1967, for diversion and use of 0.05 cubic feet per second from an unnamed spring for domestic and dairy purposes; and Water Right Claim No. 132109, signed by Berthold M. Inglin on June 24, 1974.

1. The property and any improvements to the property shall be kept safe and clean.
2. Any sanitation and sanitary facilities present on the property shall be maintained in accordance with applicable state and local public health standards.
3. Any plans for improvements to these lands shall be reviewed and approval given by Pierce County or its successors to assure compliance with these Covenants. This does not apply to routine maintenance. Improvements include but are not limited to picnic tables, trails, viewpoints, rest areas, docks, benches, boat launches, restrooms, and parking lots. Work shall not commence without written approval from Pierce County or its successors.
4. Proposals for leases, easements, rights-of-way, and/or other conditions or restrictions which could potentially limit the use of or alter the character of these lands, shall be reviewed and approved by Pierce County or its successors for compliance and consistency with these Covenants.
5. These lands shall be kept open for public use at reasonable hours and times of the year.
6. These lands shall be open for the use of all segments of the public without restriction because of the race, creed, color, gender, religion, national origin or residence of the user.
7. Roads, trails, tables, benches, and other improvements shall be kept in reasonable repair throughout their estimated lifetime, so as to prevent undue deterioration that would discourage public use.
8. These lands shall be operated and maintained in accordance with all applicable federal, state, and local laws and regulations.
9. User or other types of fees may be charged in connection with areas that are the subject of these Covenants, provided that the fees and charges are

commensurate with the value of recreation services or opportunities furnished and are within the prevailing range of public fees and charges within the state for the particular activity involved.

10. The floodplain portion of the premise shall be used only for purposes compatible with open space, recreation, or wetlands management practices.
11. No new structures or improvements shall be erected in the floodplain portion of the property unless all open on all sides and functionally related to open space use.
12. All stormwater must be retained on the property and site.
13. No livestock shall have unrestricted access to the property and site.
14. If these lands are sold by the District to another party, the buyer must be a non-profit organization with the same purposes and goals to preserve this land for the future.



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

October 21, 2005

RECEIVED
OCT 26 2005
WATER PROGRAMS

Mr. Dan Wrye
Environmental Services Program Manager
Pierce County Public Works and Utilities
9850 64th Street West
University Place, WA 98467-1078

Re: **South Prairie Creek TMDL Implementation Actions**

Dear Mr.  Wrye:

Thank you for meeting with Bill Moore, Stephen Bernath, and me on May 24, 2005 to discuss pollution trading options related to the South Prairie Creek TMDL. I apologize for the delay in giving you a formal response to this conversation and to your April 19, 2005 letter. The issues we discussed centered around pollution trading and what (if any) parts of the TMDL will become elements of the upcoming municipal stormwater permit for Pierce County and the Washington State Department of Transportation (WSDOT).

The South Prairie Creek Temperature and Fecal Coliform Bacteria TMDL identified needed fecal coliform reductions in both the upper and lower portions of the South Prairie Creek watershed. The TMDL identified bacteria load allocations for three locations in the mainstem and three tributary locations. The three mainstem locations were associated with above the Town of South Prairie Wastewater Treatment Plant outfall, at the Inglin Dairy Bridge, and at the fourth bridge on Washington State Highway (SR) 162, north of the Carbon River. Bacteria load reductions were also determined for Spiketon Creek/Ditch where it crosses SR 165, the unnamed Tributary 1 at SR162, and the unnamed Tributary 1 at its confluence with South Prairie Creek. All of the bacterial load allocations dealt with non-point source (diffuse) pollution sources.

We reviewed the materials you sent regarding water quality modeling and the acquisition, decommissioning, and restoration plans for the x-Inglin Dairy property. We agree with your assessment that eliminating the dairy operation will significantly improve the water quality in the lower portions of the South Prairie Creek watershed and offset the Tributary 1 bacteria loading. Other than possibly monitoring and participation as a stakeholder when adaptive management discussions are needed, Ecology does not anticipate that Pierce County will be asked to do anything further to meet the TMDL requirements in the lower portions of the watershed. WSDOT will also have DIP responsibilities for Tributary 1, including verification monitoring of bacterial reductions they are responsible for. Ecology will also request their participation as a stakeholder in the TMDL when adaptive management discussions are needed.

Improvements in the upper watershed are also needed to meet bacteria reduction targets for South Prairie Creek. Solutions identified in the DIP for the Spiketon Creek/Ditch system focus around riparian re-vegetation, on-site septic system management, and pollution reductions through landowner education



efforts. We envision that the Pierce Conservation District would likely be the lead for riparian efforts, and the Tacoma-Pierce County Health Department for on-site work. Pierce County's obligations would focus on maintenance and "softer" landowner education efforts in this part of the watershed. Due to the nature of the remediation required, these obligations are unlikely to become requirements of Pierce County's municipal stormwater permit.

While the removal of the dairy will improve water quality, we are less certain on how much reduction of bacterial loading is over and above that needed to meet water quality standards. This is important when considering pollution trading. Any trade must show that what is being offered at one location is greater than the amount of pollution needing to be reduced at another location. In addition, a determination of the net environmental benefit from any trade must also be shown. Answers to these questions are difficult to determine based upon the present information and in general are more difficult to determine when pollution contributions are from diffuse sources. Because of this uncertainty, we cannot concur with your request for a pollution trade.

Rather than focusing on pollution trading, we acknowledge that you have started the ball rolling on TMDL implementation in the lower watershed by putting best management practices in place. With a two pronged implementation effort (upper and lower watershed) if you are comfortable that water quality results already exceed expectations for the lower watershed, we would support a shift of implementation focus to the upper watershed. Improvements should be pursued in both areas.

The question you raised regarding the level of necessary water quality monitoring to establish the benefits from the dairy acquisition is challenging and may be a question with no right or wrong answer. I agree that employing a statistically defensible approach (800+) samples is impractical and may be unnecessary. I further believe that the level of effort toward showing improvement should not exceed that of showing impairment. With that in mind, I will pursue this question with Ecology technical staff and others.

As you are well aware, compliance with water quality standards is an ongoing effort and not a one-time initiative. Future land use decisions and development pressure within the South Prairie Creek watershed could potentially over-ride any gains made through TMDL implementation efforts. Pollution reductions in excess of that needed to just meet standards gives the Creek more resilience against future pollution. Achieving water quality standards in South Prairie Creek and ensuring water quality improvement and protection for years to come is a meritorious goal. We should settle for no less.

We applaud Pierce County's visionary approach toward the Inglin Dairy acquisition, recognizing that it provides public utilization of the property and at the same time addresses a significant source of pollution. Acquisition of this property was an extraordinary opportunity; and we are pleased that you, the Cascade Land Conservancy, Pierce Conservation District, and others were able to partner. Your efforts are keeping the water glass for South Prairie Creek "half-full" rather than "half-empty". Kudos.

Sincerely,



Kim O. McKee
Water Quality Program
Southwest Regional Office