Water Cleanup Plan for Bacteria in the Lower Dungeness Watershed

Total Maximum Daily Load (TMDL) Submittal Report

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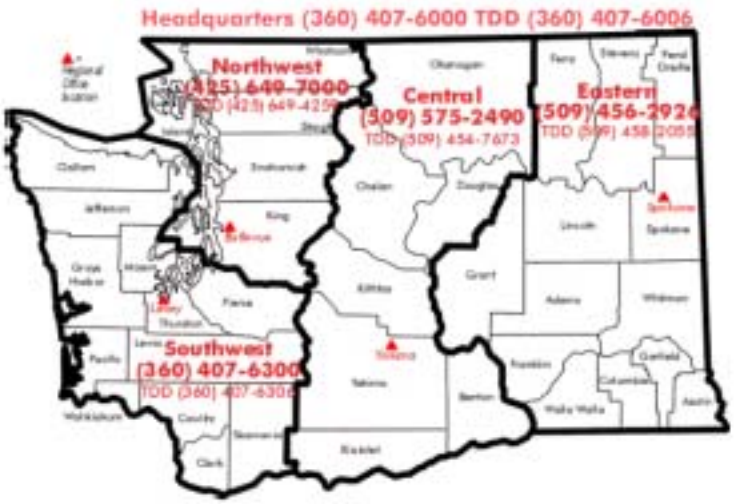

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List of Abbreviations

BMP	best management practice
CCD	Clallam Conservation District
cfs	cubic feet per second
Ch.	Chapter
CM	creek mile, measured from the mouth of the creek
County	Clallam County
DOH	Washington State Department of Health
DRMT	Dungeness River Management Team
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FC	fecal coliform
GMV	geometric mean value
MF	Membrane filter
mg/L	milligrams per liter
ml	milliliters
MPN	Most probable number
ppt	parts per thousand
RCW	Revised Code of Washington
RM	river mile, measured from the mouth of the river
SIS	Summary Implementation Strategy
TMDL	Total Maximum Daily Load
Tribe	Jamestown S'Klallam Tribe
WAC	Washington Administrative Code
Workgroup	Clean Water workgroup
WRIA	Water Resource Inventory Area

Introduction

Section 303(d) of the federal Clean Water Act requires Washington State Department of Ecology (Ecology) and the United States Environmental Protection Agency (EPA) to establish the Total Maximum Daily Load (TMDL) of each pollutant that causes a water body to not meet water quality standards.

The Dungeness River/Matriotti Creek Fecal Coliform Bacteria TMDL is established to address water quality impairments due to high fecal coliform bacteria (FC) levels in the lower Dungeness River watershed. It is also intended as an interim step to help protect marine water quality standards and shellfish harvesting in Dungeness Bay. A related circulation study currently underway in Dungeness Bay will lead to a Bay TMDL in 2003.

A TMDL includes: problem identification, technical analysis to determine the load capacity for the listed pollutant, and evaluation and allocation of pollutant loads for various sources. It is required to consider seasonal variations and include a margin of safety that takes into account any lack of knowledge about the causes of the water quality problem or the waterbody's ability to assimilate pollution. Finally, a plan with an implementation schedule is developed to address the sources of pollution. This "Water Cleanup Plan" is developed with participation of the public and other government entities. All TMDLs must be approved by the EPA.

The Dungeness River/Matriotti Creek TMDL applies to the lower Dungeness River, Hurd and Matriotti creeks, Meadowbrook Creek and Slough, Golden Sands Slough, Cooper Creek, and several irrigation ditches that empty into Dungeness Bay. Figures 1 and 2 show the study area and monitoring sites.

"Concentration" is the amount of a substance in a given amount of water (for instance, bacteria colonies per milliliter).

"**Load**" refers to the total amount of a pollutant being carried by a waterbody. It is calculated by multiplying the concentration of the pollutant times the volume of water.

"Total Maximum Daily Load" (or TMDL) is the amount of pollution that a waterbody can assimilate before beneficial uses (such as swimming and shellfishing) are affected.

Study Area and Monitoring Sites

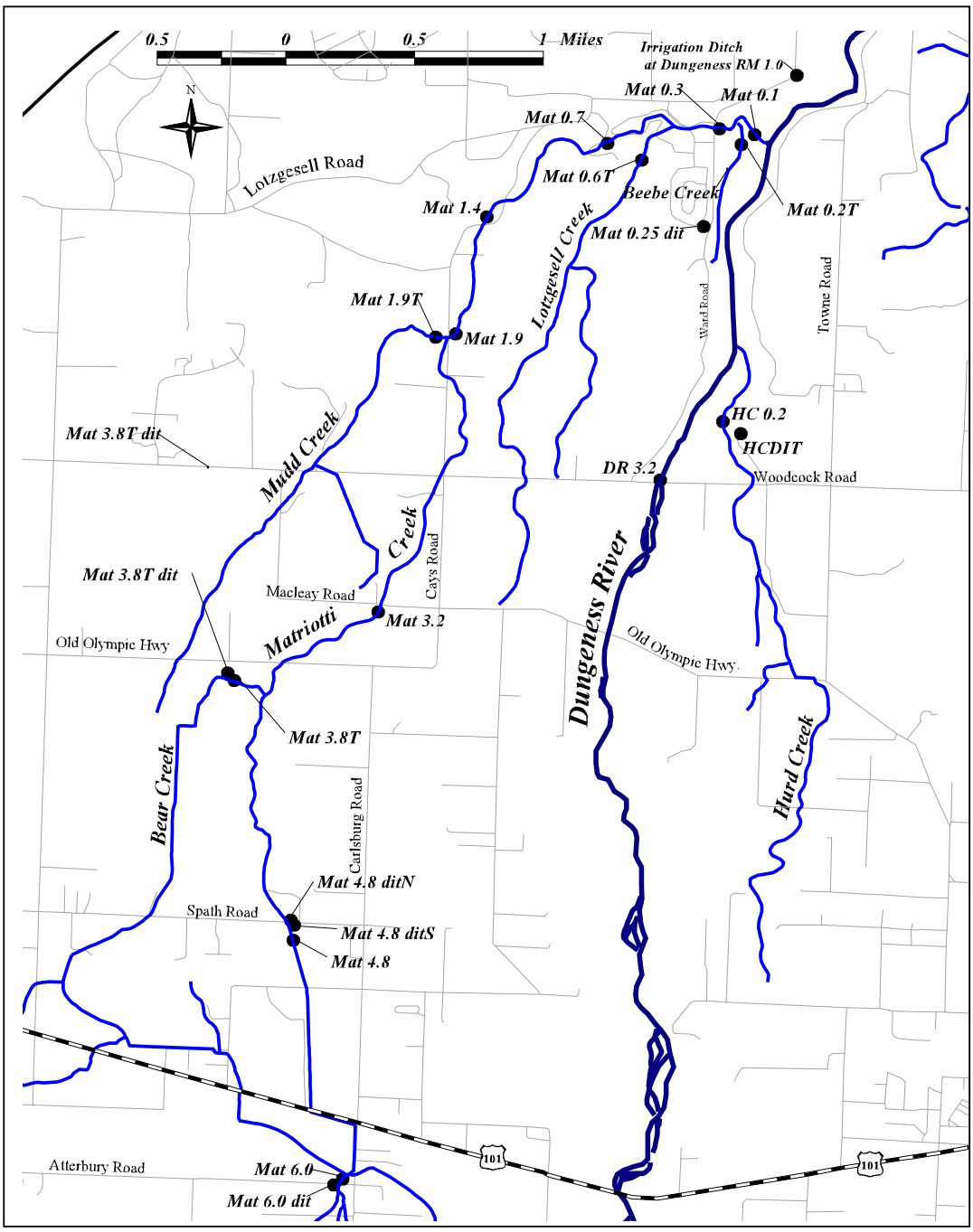

Figure 1. Dungeness River, Matriotti and Hurd Creek Water Quality Monitoring Sites.

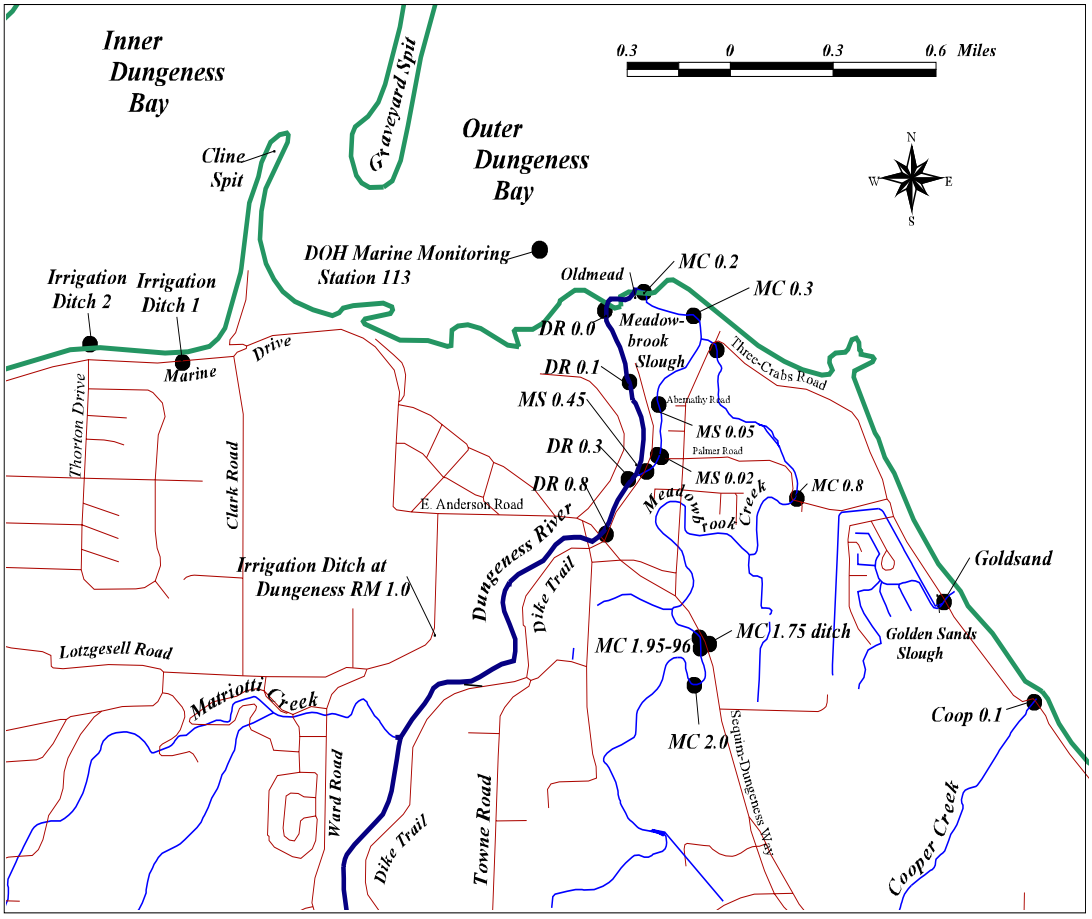

Figure 2. Dungeness River, Meadowbrook Creek, Cooper Creek, Golden Sands Slough, and Irrigation Ditch Water Quality Monitoring Sites.

Background

The Dungeness River, located in the northeast corner of the Olympic Peninsula, is the major freshwater tributary to Dungeness Bay. The river is 32 miles long and drains 172,517 acres. The upper two-thirds of the watershed are in the Olympic National Forest and Olympic National Park. The lower 13-mile stretch of river flows through mostly private land. The Dungeness River emerges through the foothills at about river mile (RM) 10 to the relatively flat Dungeness valley (Clallam County, 1993).

This study focuses on the Dungeness River and its tributaries below RM 3.2, below Woodcock/ Ward Road bridge (north of Highway 101). Major tributaries in this stretch include Matriotti and Hurd creeks. This study also includes tributaries to Dungeness Bay: Meadowbrook Creek and Cooper Creek that enter the bay to the east of the Dungeness River, as well as irrigation ditches. Figures 1 and 2 present a map of the study area and sampling sites.

The area climate is mild, because it lies in the rain shadow of the Olympic Mountains and close to the Strait of Juan de Fuca and the Pacific Ocean. Annual precipitation varies from 15 inches near Sequim to 80 inches at the headwaters of the Dungeness River (Clallam County, 1993). Average monthly precipitation for Sequim is presented in Table 1.

The Dungeness River typically has sharp peak flows in June from snow run-off events and another period of higher flows between November and February. Table 1 presents average monthly flows for the Dungeness River at RM 11.0.

Table 1. Average monthly precipitation for Sequim, and average monthly flow discharge at Dungeness RM 11.0.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average rainfall in inches *	2.01	1.40	1.22	0.99	1.26	1.09	0.68	0.62	0.81	1.38	2.76	2.08
Average flow in cfs at Dungeness RM 11.0**	402	390	295	326	565	706	498	268	174	213	355	434

* period of record 1980-2000 (Western Regional Climate Center)
** period of record 1923-2000 (USGS)

Land uses in the study area include residential, commercial, and agricultural. With increasing urbanization of the Sequim area, residential use is becoming a more predominant land use. Population in unincorporated Clallam County increased by 16% from 1990-2000, with most of the growth occurring in the eastern end of the Sequim-Dungeness valley (Wilson, 2002). While the city of Sequim is on a sewer system, residences and commercial establishments in the rural areas use on-site sewage treatment systems.

The study area contains an extensive irrigation system. All nine irrigation districts or companies are managed by the Dungeness River Agricultural Water Users Association. In the lower

Dungeness basin, there are 61.7 miles of irrigation ditches and 111 miles of laterals (Montgomery, 1999). Matriotti, Hurd, and Meadowbrook creeks are used as a conveyance for the irrigation system.

Descriptions of waterbodies in the study area and specific land uses that relate to potential sources of bacteria are described below:

1. Meadowbrook Creek and Slough

Meadowbrook Creek is located to the east of Dungeness River (Figure 2). The creek is approximately 3.0 miles long. An irrigation ditch flows into Meadowbrook Creek at creek mile (CM) 1.75. This ditch also receives irrigation tailwater return and stormwater from Sequim-Dungeness Way. Meadowbrook slough is a 0.5 mile slough entering Meadowbrook Creek at CM 0.25. The slough is fed with water from an outtake at Dungeness RM 0.3; a landowner on the Dungeness controls flow at the outtake. The slough widens and deepens before entering Meadowbrook Creek near the mouth. Since 1995 the mouth of Meadowbrook Creek has been migrating eastward. In 1995 it flowed into the Dungeness River just above the mouth; currently it flows into Dungeness Bay east of the Dungeness River.

Land use along Meadowbrook Creek includes a horse farm near the mouth, a wetland bird refuge, as well as agricultural, residential, and commercial activities in the community of Dungeness. Land use along Meadowbrook Slough includes residences and a private wildlife area near the mouth. All residences and commercial properties use on-site sewage treatment systems.

2. Cooper Creek, Golden Sands Slough, and Irrigation Ditches

Cooper Creek and Golden Sands Slough discharge into Dungeness Bay east of Meadowbrook Creek (Figure 2). Cooper Creek is a wetlands-fed creek, and the uplands are undeveloped. The downstream half of the creek has been straightened. The creek mouth is a tide gate installed in a bulkhead. In 1995 a small portion of the tide gate was removed to allow fish passage (Haring, 2000). There is residential development at the mouth of the creek and a fenced horse pasture along the west side of the creek.

Golden Sands Slough drains a series of man-made channels dug into wetlands behind the marine shoreline. The slough is fed by the wetlands, and there is a tide gate at the mouth of the slough. Water in the slough tends to be stagnant and saline. Along the canals a number of permanent homes were built that use on-site sewage treatment systems. The remainder of the lots is now restricted to recreational use only. Several of these lots are occupied year-round by recreational camper vehicles.

There are a few irrigation ditches that discharge to inner Dungeness Bay west of Cline spit; Irrigation Ditches 1 and 2 were sampled for this study (Figure 2). The irrigation tailwater entering the bay from two of these ditches was sampled. Water from these ditches originates

from the Dungeness River and is used for agricultural purposes. During storm run-off events, these ditches also collect road and stormwater runoff.

3. Dungeness River

The Dungeness River below RM 3.2 is confined by levees along both banks, including a 3-mile long levee on the right bank and two smaller levees along the left bank (looking downstream). Tributaries below RM 3.2 include Matriotti and Hurd creeks. There is an irrigation tailwater return to the river at approximately RM 1.0, and an irrigation outtake at RM 0.3 that serves as the source of Meadowbrook Slough.

4. Hurd Creek

Hurd Creek is 1.0 mile in length and flows into the Dungeness River on the right bank at RM 2.7 (Figure 3). Hurd Creek starts as a spring and is augmented at times by tailwater from the irrigation system. Land use on the creek includes residences and a fish hatchery at CM 0.5. All homes in the area are served by on-site sewage treatment systems.

5. Matriotti Creek

Matriotti Creek is 9.3 miles long and drains 13.6 square miles (Figure 2). It enters the Dungeness River on the left bank (looking downstream) at RM 1.9. Land uses include residential, commercial, agricultural, and livestock use. A large exotic animal park, the Olympic Game Farm, is located near the mouth of Matriotti Creek. Matriotti Creek is used as a conveyance for the irrigation system. Irrigation water diverted from the Dungeness River enters Matriotti at CM 6.0 near Atterbury Road. Bear and Mudd creeks, which receive irrigation tailwater returns, enter Matriotti Creek at CM 3.8 and 1.95, respectively. There is an irrigation tailwater return ditch along Spath Road that discharges to Matriotti Creek at CM 4.8. At Matriotti CM 0.25, a drainage ditch that drains the area south of the Olympic Game Farm discharges to Matriotti Creek.

Applicable Water Quality Criteria

Waterbody classifications in the study area include Class A and AA, freshwater and marine. Table 2 describes the applicable water quality standards for each waterbody in the study area. For comparison of data to water quality standards, salinity levels were evaluated.

To determine if the fresh or marine standard applies, the following criteria are used for fecal coliform: the freshwater criteria shall be applied at any point where 95% of the vertically averaged daily maximum salinity values are less than or equal to 10 parts per thousand or greater (Chapter 173-201A Washington Administrative Code). All salinity data for each site during

each survey were averaged to determine whether marine or freshwater standards applied to that site.

Table 2. Classification for waterbodies included in this study

Waterbody	Classification
Lower Dungeness River	Class A freshwater
Hurd Creek	Class A freshwater
Matriotti Creek	Class A freshwater
Meadowbrook Creek	Class AA freshwater
Meadowbrook Creek at mouth	Class AA marine for all parameters except FC. FC Class AA freshwater.
Meadowbrook Slough	Class AA freshwater
Meadowbrook Slough near mouth	Class AA marine for all parameters except FC. FC Class AA freshwater.
Cooper Creek	Class AA marine for all parameters except FC. FC Class AA freshwater.
Golden Sands Slough	Class AA marine for all parameters
Irrigation ditches to Dungeness Bay	Class A freshwater
Dungeness Bay	Class AA marine water

The Washington State Water Quality Criteria for parameters used in this study are described in Table 3.

Table 3. Washington State Water Quality Criteria for Selected Parameters (Ch. 173-201A WAC)

Parameter	Class AA (Extraordinary)		Class A (Excellent)	
	Fresh	Marine	Fresh	Marine
Fecal Coliform Bacteria				
Shall not exceed a geometric mean value of (number of colonies/100 mL):	50	14	100	14
With not more than 10% of samples exceeding (number of colonies/100 mL):	100	43	200	43
Dissolved Oxygen				
Shall exceed (mg/L):	9.5	7.0 *	8.0	6.0 *
Temperature				
Shall not exceed, due to human activities (°C): (When natural conditions exceed this value, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.)	16.0 **	13.0 **	18.0 **	16.0 **
pH				
Shall be within the range of (pH units):	6.5 - 8.5	7.0 - 8.5	6.5 - 8.5	7.0 - 8.5
Human-caused variation shall be within the range of less than (pH units):	0.2		0.5	
Turbidity				
When background turbidity is 50 NTU or less, shall not exceed background turbidity by (NTU):	5		5	
When background turbidity is more than 50 NTU, shall not have more than an increase of:	10%		10%	
Aesthetics				
Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.				
Ammonia				
Ammonia criteria are dependent on the temperature and pH of the water.				

* When natural conditions, such as upwelling occur, causing the dissolved oxygen to be depressed near or below this value, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L.

** Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

Water Quality and Resource Impairments

Since 1991 bacterial contamination in Matriotti Creek has been documented as a water quality problem through monitoring efforts by the Conservation District and Clallam County. Matriotti Creek has been on Washington's 303(d) list since 1996 for not meeting water quality standards for fecal coliform. Fecal coliform is an indicator of the presence of possible harmful pathogens (e.g., bacteria and viruses) associated with human and animal waste. There are no point sources or regulated stormwater discharges to Matriotti Creek. Nonpoint pollution is the source of fecal coliform problems in the basin.

Since 1997 Dungeness Bay has been experiencing increases in fecal coliform bacteria. In 2000 and 2001 portions of Dungeness Bay were reclassified by DOH from *Approved* to *Prohibited* for commercial shellfish harvest. The shellfish area was downgraded because fecal coliform levels in the bay did not meet National Shellfish Sanitation Requirements for water quality in commercial shellfish harvesting areas.

This TMDL addresses fecal coliform bacteria in Matriotti Creek, including both creek water segments that were included on the 1996 and 1998 303(d) list. Table 3 lists these segments as well as segments found to be impaired but not currently listed.

Table 4. Waterbodies impaired for fecal coliform bacteria in the Dungeness River and Matriotti Creek TMDL study.

Waterbody	Township, Range, Section	New Waterbody ID Number	Old Waterbody ID Number
Waterbodies on the 1996 and 1998 303(d) list			
Matriotti Creek	30N 04W 03	AZ071Y	WA-18-1012
Matriotti Creek	31N 04W 35	AZ071Y	WA-18-1012
Impaired waterbodies addressed in this TMDL but not currently on the 303(d) list			
Matriotti Creek	30N 04W 22	AZ071Y	WA-18-1012
Matriotti Creek	30N 04W 10	AZ071Y	WA-18-1012
Matriotti Creek	30N 04W 02	AZ071Y	WA-18-1012
Matriotti Creek	31N 04W 35	AZ071Y	WA-18-1012
Matriotti Creek	31N 04W 36	AZ071Y	WA-18-1012
Meadowbrook Creek	31N 03W 31	No ID number available	
Meadowbrook Creek	31N 03W 30	No ID number available	
Meadowbrook Creek	31N 04W 41	No ID number available	
Golden Sands Slough	31N 03W 31	No ID number available	
Cooper Creek	31N 03W 32	No ID number available	
Dungeness River RM 0.1	31N 04W 41	No ID number available	
Irrigation Ditch 1	31N 04W 38	No ID number available	
Irrigation Ditch 2	31N 04W 02	No ID number available	

The Dungeness and Matriotti Creek TMDL also addresses fecal coliform in six other segments of Matriotti Creek, two tributaries to Matriotti Creek, and two segments of Meadowbrook Creek,

Cooper Creek, and Golden Sands Slough (Table 3). It was determined during development of the TMDL that these waterbodies were not meeting water quality standards for fecal coliform and had not previously been included on the Washington 303(d) list. The information contained in this TMDL demonstrates that these non-listed waters are, in fact, water quality limited segments that are impaired and in need of a TMDL.

Seasonal Variation and Critical Conditions

Seasonal patterns in fecal coliform concentration and loading data were evaluated for all sites annually and seasonally. Results of this review are presented in *Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study*, Appendix E. The results showed that for most sites higher fecal coliform concentrations are present during the irrigation season (April through September). Fecal coliform loading was also higher during the irrigation season for a majority of the tributaries and the Dungeness River above RM 0.8. Fecal coliform concentrations for the Dungeness River at RM 0.1 (the site nearest the mouth) are higher during the irrigation season; however, fecal coliform loading is fairly consistent throughout the year, with a slight increase during the wet season.

In a review of the Dungeness Bay marine data, Rensel and Smayda (2001) found higher fecal coliform concentrations in the fall and winter season. Higher survival of fecal coliform in the bay is to be expected during late fall and winter, because two primary factors that increase fecal coliform die off (water temperature and light) are reduced at that time, probably allowing for relatively longer survival in waters of the inner bay (EPA, 2001; Bowie, 1985).

The beneficial use with the most restrictive fecal coliform criteria is shellfish harvesting in Dungeness Bay. The TMDL targets and fecal coliform reductions for the Dungeness River and tributaries need to be protective of all downstream beneficial uses. A large portion of the bay is closed to shellfish harvesting because water quality does not meet the National Shellfish Sanitation Program criteria. The water quality in the harvesting area must have a geometric mean value of no more than 14 most probable number (MPN)/100mL, with an estimated 90^{th} percentile value less than 43 MPN/100mL.

To protect downstream water quality and beneficial uses in Dungeness Bay, the Dungeness and Matriotti TMDL must encompass the entire year, and address the possibility of bacteria contamination from several potential sources with different delivery and transport mechanisms.

Technical Analysis

Field and laboratory data were compiled and organized using Excel® spreadsheet software. Water quality results from field and laboratory work were also entered into Ecology's Environmental Information Management database. Statistical calculations were made using either Excel® or SYSTAT® software.

The primary focus of this study is fecal coliform bacteria. Membrane filter (MF) method was used for data analysis throughout, unless otherwise noted. Field replicates and right and left bank (looking downstream) results for the Dungeness River were arithmetically averaged.

For comparison to standards, salinity levels were evaluated. Marine standards apply at salinities of 10 parts per thousand (ppt) or greater for fecal coliform bacteria, and at 1 ppt or greater for all other parameters. Table 2 describes the waterbody classification for each area in the study. To evaluate compliance, fecal coliform bacteria results were compared to standards for the entire year, the irrigation season (April through September), and the wet season (November through February). Only periods with at least five surveys of data were considered to contain sufficient data to evaluate compliance with standards.

Source Identification

Paired t-tests were used to compare water quality between upstream and downstream sites. Sites were evaluated for differences in fecal coliform concentration and loading, as well as turbidity, when data were available. A two-tailed test with a significance level of $\alpha = 0.05$ was used.

For the paired t-tests and graphs, when there was a measured tributary or ditch between sites, the upstream load and the incoming tributary or ditch load were summed to represent the expected load or load sum. This load sum was compared to the measured load downstream to determine if an unidentified source of loading was present. Variation in the load sum and the measured load could also be due to sampling errors in flow and bacteria measurements, temporal variance, fecal coliform die-off, and settling.

Flows were calculated using instantaneous flow measurements, rating curves (relating flow to staff gauge height), or a mathematical relationship to flow at a comparable site. Dungeness River flows were estimated using a continuous stream flow gauging station at the Schoolhouse Road bridge (Shedd, 2001). Flows for Ward Road bridge were estimated using downstream Schoolhouse Road bridge flows and subtracting flows from tributaries between the two sites. Dungeness flows downstream of Schoolhouse Road bridge were assumed to be equivalent to flows at Schoolhouse Road bridge. There are no known tributaries to the Dungeness River between the Schoolhouse Road bridge and the mouth.

No practical unit of loading is available for fecal coliform so, for the loading analyses, fecal coliform (fc) concentrations (# fc/100mL) were multiplied by the flow discharge in cubic feet per second (cfs) to obtain loading in # fc/100mL x cfs. Fecal coliform annual or seasonal loads were arithmetic means of the instantaneous loads in that time period to provide relative comparisons.

TMDL Analysis

The statistical rollback method (Ott, 1995) has been used by Ecology as a method for determining the necessary reduction for both the geometric mean value (GMV) and 90th percentile bacteria concentration (Joy, 2000; Seiders, 2001). In the case of the TMDL, compliance with the most restrictive of the dual fecal coliform criteria determines the bacteria

reduction needed. Fecal coliform sample results for each site in this study were found to follow log-normal distributions, and the statistical rollback method could be applied to log-transformed values.

The rollback method uses statistical characteristics of a known data set to predict the statistical characteristics of a data set that would be collected after pollution controls have been implemented and maintained. In applying the rollback method, the target fecal coliform GMV and target 90th percentile are set to the corresponding water quality standard. The reduction needed for each target value to be reached is determined. The reduction factor (e.g., percent reduction) that allows both target values to be met is selected and applied to the known GMV and 90th percentile. The result is a revised target value for the GMV or the 90th percentile, depending upon which reduction factor was used. In most cases a reduction of the 90th percentile is needed, and application of this reduction factor to the study GMV yields a target GMV that is usually less (i.e., more restrictive) than the water quality standard. The 90th percentile is used as an equivalent expression to the "no more than 10%" criterion found in the second part of the water quality standards for fecal coliform (Seiders, 2001).

Loading Capacity and Load Allocations

Tributaries to Dungeness Bay

Currently sampling is being conducted for the Dungeness Bay TMDL, and a report is expected to be completed in early 2003. The Dungeness Bay TMDL will examine whether the fecal coliform load allocations for the tributaries to Dungeness Bay established in this report need to be adjusted to protect the shellfish harvesting in the bay. Because this study used the conservative assumption that water at the mouths of Dungeness River and tributaries in the study area must meet shellfish protection criteria, no significant adjustments are expected to be needed.

To determine fecal coliform concentrations that are protective of beneficial uses in the bay, concentrations for Dungeness RM 0.1 and Department of Health (DOH) marine station 113 were compared (Figure 2). Both stations were sampled for 13 of the 18 TMDL surveys. A non-parametric paired Wilcoxon signed rank test was used to determine if data from the station at Dungeness RM 0.1 and DOH station 113 had significantly different fecal coliform concentrations. Results showed fecal coliform levels at the two sites were not significantly different. However, the DOH station had a slightly higher geometric mean fecal coliform concentration than the Dungeness RM 0.1 station, with geometric mean values of 22 and 14 fc/100mL, respectively. This may be because the marine samples were analyzed by the DOH laboratory in Seattle using the MPN method of fecal coliform analysis, while the freshwater samples were analyzed by Ecology's Manchester Environmental Laboratory using the MF method. Different laboratories and methods could account for the slightly different results.

Since November 2000, the Jamestown S'Klallam Tribe has continued sampling for fecal coliform at most of the TMDL sites including Dungeness RM 0.1 and DOH marine station 113. The fecal coliform data obtained by the tribe used the fecal coliform MF method with the exception of four sample events where MPN was used to obtain fecal coliform concentrations at the DOH 113 site.

To further test the hypothesis that fecal coliform concentration at Dungeness RM 0.1 and DOH station 113 were essentially the same, the tribal data set (n=11) and the Ecology data set (n=13) were combined and a paired t-test was used to determine if the two sites were significantly different. There was also no significant difference in fecal coliform concentrations between the two sites using the larger data set (n=24). The DOH station again had a slightly higher geometric mean that Dungeness RM 0.1, with geometric mean values of 13 and 11 fc/100mL, respectively.

The Dungeness RM 0.1 and DOH marine station 113 are in close proximity (0.4 miles) and did not significantly differ in fecal coliform concentrations during this study. Therefore, to provide adequate protection to the shellfish area, the TMDL target fecal coliform concentration set for the mouth of the Dungeness River needs to be set equivalent to the same fecal coliform standard as the bay (Class A marine fecal coliform standard). While the Dungeness River station at RM 3.2 met this standard, the downstream stations did not. Reductions in Dungeness River fecal coliform concentrations are needed downstream of RM 3.2. Recommended fecal coliform TMDL targets for the Dungeness River are included in Table 5.

Meadowbrook and Cooper creeks and Golden Sands Slough must meet their current classification, Class AA freshwater, and the irrigation ditches to the bay must meet Class A freshwater standards. Because the Dungeness River is the major fecal coliform loading contributor to the bay, the current standards for other tributaries and ditches to the bay are considered adequate. In addition, the Rensel and Smayda (2001) report concluded that spring and summer marine water circulation in nearshore areas east of the Dungeness River mouth,

Table 5. Recommended fecal coliform TMDL load allocations and target concentrations for tributaries to Dungeness Bay.

Site	Study FC GMV* (#fc/100mL)	Study FC 90^{th} %tile (#fc/100mL)	Target FC GMV (#fc/100mL)	Target FC 90^{th} %tile (#fc/100mL)	Required Change (%)	Target FC Load Allocation (conc x flow)
Dungeness River RM 0.1	15	47	13	43	-9	6812
Meadowbrook Creek CM 0.2	33	243	14	100	-59	200
Cooper Creek	49	140	35	100	-28	214
Golden Sands Slough	109	565	19	100	-82	33
Irrigation Ditch 1	150	273	100	182	-33	12
Irrigation Ditch 2	153	1281	24	200	-84	< 1
Total						7271

***** Geometric Mean Value

such as Three Crabs Beach area, is generally southeasterly, away from the inner bay. Accordingly, freshwater flows from streams, seeps, or on-site sewage treatment systems in those areas would likely have less impact to inner Dungeness Bay. The exception to this would be during some winter periods when strong easterly or southeasterly winds and neap tides occur, which could enhance movement of shallow nearshore outer bay waters toward or into inner Dungeness Bay (Rensel, 2002).

The statistical rollback method (Ott, 1995) was used to determine the percent fecal coliform reduction necessary at each site to meet the desired concentration reduction targets recommended above. Table 5 describes the target fecal coliform geometric mean values and 90th percentile values for each site. The target values were used to determine loading reductions described in Table 5.

Dungeness River

In the previous section, the TMDL target for the mouth of the Dungeness River (RM 0.1) was established as *GMV 13 fc/100mL and a 90th percentile of 43 fc/100mL* (Table 5) to protect shellfish harvesting in the bay. This section evaluates fecal coliform loading to the Dungeness River. It establishes TMDL targets for contributors to the river, so that the TMDL target is met at the mouth. The analysis proceeds from downstream to upstream.

For the load balance, the Dungeness River was divided into three reaches:

Reach	Tributaries entering the river in this reach (sampled in this study)
RM 0.1 to 0.3	None
RM 0.3 to 0.8	None
RM 0.8 to 3.2	Matriotti and Hurd creeks and one irrigation ditch at Dungeness RM 1.0

Fecal coliform loads and concentrations at the downstream end of each reach were compared to measured loads and concentrations coming into the reach (both upstream and tributaries). The difference between input and output was termed the "residual". If the residual is positive, a source of bacteria in that reach is indicated. If the residual is negative, bacteria die-off or settling is indicated. Table 6 summarizes annual average values for flow, fecal coliform concentrations, and fecal coliform loads for tributaries to the Dungeness River.

Fecal Coliform Load Allocation

The loading capacity for Dungeness River and Matriotti Creek are set to meet the fecal coliform criteria set in the bay. Fecal coliform loading capacities are expressed as concentrations.

To determine load allocations, the loading analysis proceeded downstream to upstream, starting with the previously established TMDL target for the mouth of the Dungeness River of a geometric mean value 13 fc/100mL, and a 90th percentile not to exceed 43 fc/100mL.

For the lowermost reach, RM 0.1 to 0.3, average annual sampling results in Table 6 show that there was a slight increase in loading over the length of this reach (128 fc/100mL x cfs), representing about 2% of the total river loading. This residual indicates a source of bacteria not yet identified, that should be eliminated. Therefore, the target load for this residual is zero. (There should not be a net increase of loading over this short river reach with this large volume of water). Therefore, the previously identified TMDL target of a geometric mean value 13 fc/100mL, and a 90th percentile not to exceed 43 fc/100mL can be moved upstream to the bottom of the middle reach: RM 0.3 to 0.8.

Table 6. Mean daily values for fecal coliform concentrations, flow, loading and relative contributions of flow and fecal coliform loading for reaches of the Dungeness River.

	Inputs and Outputs (measured) and Residual	Mean FC (#fc/100mL)	Mean Flow (cfs)	Mean FC Load (#fc/100mL x cfs)	Flow Contribution to Reach (%)	FC Contribution to Reach (%)
Reach RM 0.1 to 0.3						
Input	Upstream end of reach (RM 0.3)	26	413	7461	100	98
Residual	Residual contributions	-	0	128	0	2
Output	Downstream end of reach (RM 0.1) *	21	413	7589		
Reach RM 0.3 to 0.8						
Input	Upstream end of reach (RM 0.8)	37	413	9493	100	100
Residual	Residual contributions	0	0	-2032	0	0
Output	Downstream end of reach (RM 0.3)	26	413	7461		
Reach RM 0.8 to 3.2						
Input	Upstream end of reach (RM 3.2)	13	390	3279	94	34
	Matriotti Creek	381	17	5972	4	62
	Hurd Creek	47	6	316	1	3
	Irrigation ditch at Dungeness RM 1.0	132	0.1	13	0	< 1
Residual	Residual contributions	0	0	-87	0	0
Output	Downstream end of reach (RM 0.8)	37	413	9493		

Mean fecal coliform load is an average of all fecal coliform loading values. Loading values are calculated by multiplying the instantaneous flow x fecal coliform concentration. Mean fecal coliform concentration is an average of all fecal coliform concentrations (arithmetic mean), just as the mean flow is an average of all flow measurements obtained. Thus the mean fecal coliform concentration multiplied by the mean flow may not be equivalent to the mean fecal coliform load in the table.

*No sampling was conducted at Dungeness RM 0.0 during the wet season; therefore, no wet season information is available for the Dungeness RM 0.1-0.0 reach, and it was not possible to calculate mean annual values for this reach.

The fecal coliform reductions needed for the sites within this reach are shown in Table 7 and Figure 7. Loading capacity (expressed as concentrations) for Dungeness River and the tributaries below Dungeness RM 3.2 are shown in Table 7. Fecal coliform load information is also presented. There are no point source permitted discharges in the study area; therefore, the waste load allocation is equivalent to 0.

Table 7. Recommended fecal coliform TMDL load allocations and target concentrations for the Dungeness River and tributaries.

Site	Study FC GMV* (#fc/100mL)	Study FC 90th Percentile (#fc/100mL)	Target FC GMV (#fc/100mL)	Target FC 90th Percentile (#fc/100mL)	Required Change (%)	FC Target Load Allocation (conc. x flow)
Dungeness RM 0.1	15	47	13	43	-9	6812
Residual – Reach RM 0.1 to 0.3			0	0	-2	0
Dungeness RM 0.3	13	61	9	43	-29	5288
Dungeness RM 0.8	17	81	9	43	-47	5059
Irrigation ditch at Dungeness RM 1.0	83	239	60	170	-29	24
Matriotti Creek	279	783	60	170	-78	1267
Hurd Creek	12	100	12	100	0	316
Dungeness RM 3.2	6	28	6	28	0	3279

* GMV=geometric mean value

The mass balance for the middle reach (RM 0.3 to 0.8) shows a net loss, or die-off, of bacteria through the reach. To be conservative and as a margin of safety, the TMDL target was assumed to stay the same through this reach. Therefore, the target geometric mean value of 13 fc/100mL and a 90th percentile not to exceed 43 fc/100mL would apply at the bottom of the uppermost reach, at RM 0.8. Table 7 shows a geometric mean value of 9 fc/100mL for Dungeness RM 0.3 and 0.8, because in applying roll-back analysis to sample distributions at these two sites, a 9 fc/100mL geometric mean value was needed to meet the 90th percentile of 43 fc/100mL.

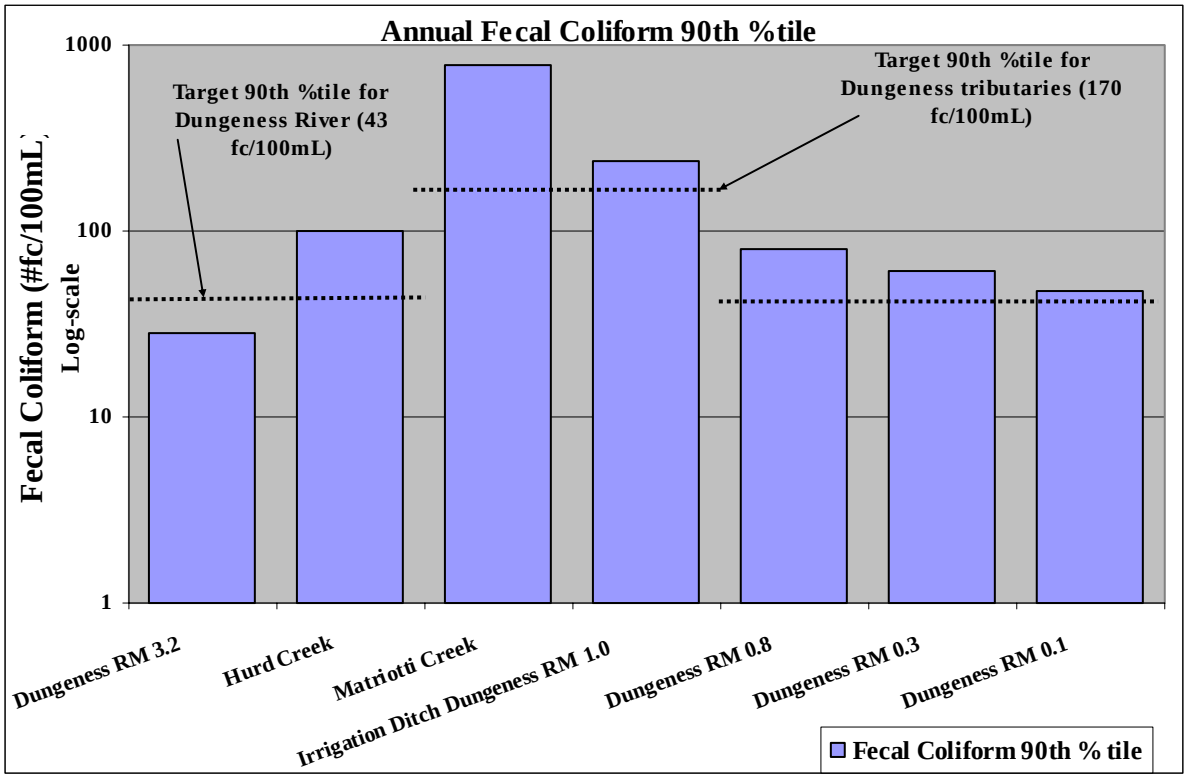

Figure 3. Dungeness River and Tributaries Fecal Coliform 90th Percentiles, and Target Fecal Coliform 90th Percentile Concentrations. (The 90th percentile is the limiting part of the fecal coliform standard for all areas in the graph).

The uppermost reach (RM 0.8 to 3.2) has contributions from Matriotti Creek, Hurd Creek, an irrigation ditch at Dungeness RM 1.0, and residual contributions. The necessary load reduction needed for the downstream end of this reach, at RM 0.8, is shown in Table 7. The next step is to determine the load reductions necessary for the three tributary loads, and any additional inputs to this reach, to meet the downstream target. The upstream boundary of this reach (Dungeness RM 3.2), with a geometric mean value of 6 fc/100mL and a 90th percentile of 28 fc/100 mL, does not require any load reduction, and the residual is negative for this reach. The remaining three inputs (Matriotti, Hurd, and irrigation ditch) need to be reduced to meet the downstream reach target.

There are many ways to allocate reductions among these three inputs. For equity, it was decided to set the target geometric means and 90th percentiles to be the same for all three. Following this approach, it was determined that a target geometric mean value of 60 fc/100mL and a 90th percentile of 170 fc/100 mL for Matriotti Creek and the irrigation ditch at Dungeness RM 1.0 was sufficient to meet the downstream target. For Hurd Creek, the current geometric mean value (12 fc/100mL) and 90th percentile already met this target and did not need to be further reduced. These load allocations are summarized in Table 7.

Margin of Safety

A margin of safety to account for scientific uncertainty must be considered in the TMDLs in order for load allocations to remain protective. The margin of safety for this TMDL is implicit; it is contained within conservative assumptions used to develop the TMDL.

Factors contributing to a margin of safety are:

- The simple mass balance calculations and subsequent derivation of target values in freshwater assumed no fecal coliform die-off. Mass-balance calculation for fecal coliform from Dungeness River to Dungeness Bay also disregarded die-off and dilution in the marine waters.

- The rollback method assumes that the variance of the pre-management data set will be equivalent to the variance of the post-management data set. As pollution sources are managed, the occurrence of high fecal coliform values is likely to be less frequent and, thus, reduces the variance and 90^{th} percentile of the post-management condition.

- The smaller the sample set used for the rollback calculation, the more stringent the reduction necessary. The lower sample size has greater variability in the data set, causing higher 90^{th} percentiles. A variable data set and a higher 90^{th} percentile meant greater reductions were needed. This is evident in the geometric mean that is necessary to achieve compliance with the 90^{th} percentile target.

Summary Implementation Strategy

Introduction

The purpose of this Summary Implementation Strategy (SIS) is to describe how the waters covered in the Dungeness River/Matriotti Creek Fecal Coliform TMDL can achieve water quality standards over time. This SIS meets the requirements of a TMDL submittal for approval as outlined in the 1997 Memorandum of Agreement between the U.S. Environmental Protection Agency and the Washington State Department of Ecology (Ecology).

Several of the sections below refer the reader to Appendix A, Clallam County's *Clean Water Strategy*. The strategy was originally written as part of establishing a Clean Water District. It was presented for public comment in May 2001, and has been updated on the basis of the findings of the *Dungeness River/Matriotti Creek Fecal Coliform Bacteria TMDL Study*.

Implementation Overview

The Dungeness River/Matriotti Creek fecal coliform bacteria TMDL is being conducted within the context of pre-existing and on-going local efforts to clean up the watershed.

Impacts from growth in Clallam County have resulted in 303(d) listings for fecal coliform in Johnson, Bell, Cassalery, Matriotti, and Bagley creeks. In addition, in April 2000, Washington Department of Health closed an area of Dungeness Bay to commercial shellfish harvesting because of risk posed by unacceptable levels of fecal coliform bacteria. The harvest closure area was expanded in spring of 2001.

Interested and responsible individuals and agencies formed a team to respond to the shellfish downgrade. That shellfish response team became the Clean Water workgroup (the workgroup) when Clallam County adopted a Clean Water District by ordinance in June 2001. The workgroup meets approximately monthly to implement the *Clean Water Strategy* by coordinating information, decisions, priorities, activities and resources. There is considerable local commitment to protecting water quality.

Clean Water Strategy activities include a combination of investigation, technical assistance, cost share, education and outreach, and enforcement. Wildlife sources are being considered, however there are few management options. Implementation activities focus on human-caused sources, primarily agricultural BMPs and on-site septic system operation and maintenance. Water quality monitoring by the Tribe, local government, state agencies, and Streamkeepers continues to augment existing information on sources and trends and helps to measure effectiveness of implementation activities. A related circulation study in Dungeness Bay will lead to a Bay TMDL in 2003.

In addition to the workgroup relationship, interlocal agreements coordinate work between Ecology and the CD, the Tribe and the CD, the Tribe and the County, and the County and the Conservation District.

While the Clean Water District ordinance stopped short of establishing permanent, assured funding for water quality activities, local groups have been successful so far at obtaining funding from outside sources. Funds administered by Department of Ecology currently support a number of water quality-related grants; five grants to the county, three to the Conservation District, and one to the Tribe. The Tribe oversees the circulation study in the Bay under a grant from EPA. And the CCD receives a variety of grants from the Conservation Commission for water quality programs. Limited funds for agricultural water quality improvement are available through the Natural Resources Conservation Service.

Implementation activities are discussed in detail in the *Clean Water Strategy*, Appendix A. Specific areas are referenced below.

The area studied in the Dungeness River/Matriotti Creek Fecal Coliform TMDL is anticipated to achieve water quality standards by 2007.

Implementation Plan Development

Following the initial shellfish closure, a response team was formed to develop a response strategy. The response team was led by Clallam County, and included:

- Government agencies: the Jamestown S'Klallam Tribe (the Tribe); Clallam Conservation District (CCD), Port of Port Angeles, Puget Sound Water Quality Action Team, Washington State Department of Health (DOH), Washington State Department of Ecology, Washington State Department of Fish and Wildlife, U.S. Fish and Wildlife Service

- Shellfish growers: Jamestown S'Klallam Tribe, NW Corner Oyster Company

- Scientific entities: Battelle Marine Lab

- Members of local watershed planning groups: Dungeness River Management Team, Marine Resources Committee

- Private citizens including tideland owners affected by the closure.

The response team began monitoring water bodies to identify the sources of pollution. They found that fecal coliform bacteria levels exceed public health-based water quality standards in most freshwater tributaries to the Bay. They elected to address water quality issues beyond the immediate concerns of shellfish closures, and form a Clean Water District. Adopted by ordinance in June 2001, The Clean Water District was created to address all pollution in the Dungeness and Sequim Bay watershed.

The *Clean Water Strategy* was developed by the workgroup and adopted as part of the ordinance. It describes on-going and proposed activities, an implementation schedule, and funding sources. The strategy was updated in early 2002 based on the conclusions and recommendations of

Ecology's TMDL water quality study. It will be further updated based on public involvement conducted prior to submittal of this TMDL for approval.

Involved Parties and Regulatory Authorities

The following is a description of the key agencies and other groups that have influence, regulatory authority, information, resources or other involvement that will be included in the coordinated effort to implement the TMDL.

- *Ecology*

  Washington Department of Ecology has been delegated authority under the federal Clean Water Act by the U.S. Environmental Protection Agency (EPA) to establish water quality standards and enforce water quality regulations under Chapter 90.48 RCW. Ecology provides financial assistance to local governments, tribes and conservation districts for water quality projects.
  Ecology's regulatory responsibility includes a role in overseeing agricultural practices. Ecology, the Conservation Commission, and local conservation districts entered into the Agricultural Compliance Memorandum of Agreement in 1988. The Agreement defines a consistent series of steps that coordinate Ecology's water pollution control responsibilities with the conservation district programs that provide technical assistance to landowners and farm operators. The steps are:

  1) Ecology receives an agricultural complaint, then verifies whether the complaint is valid or not;

  2) If a pollution problem is verified, the farm is referred to the local conservation district for assistance. If the problem is an immediate or substantial threat, Ecology is committed to require immediate corrective action;

  3) Usually, the landowner, working with the conservation district, has up to six months to develop a farm plan and an additional 18 months to implement the plan.

  4) If the landowner chooses not to work cooperatively with Ecology or the conservation district, Ecology will take appropriate action, which may include formal enforcement.

  In some situations, Ecology may initiate the investigation/enforcement process rather than responding to a complaint. This would typically be situations where the environmental concern is heightened, such as when shellfish beds are threatened, other public health or economic resources are at risk, or where water quality violations are being addressed through a TMDL.

- *Jamestown S'Klallam Tribe*

  The Tribe began monitoring at the mouth of the Dungeness River when DOH first proposed a closure zone in 1977. With assistance from Clallam County, CCD, and Ecology, they have continued monitoring freshwater sources. Currently they monitor some or all stations from

the TMDL study on a monthly basis. They also collect fresh water samples at key stations when marine samples are collected. Monitoring efforts will continue as long as funding can be obtained. They have conducted special studies, and currently oversee the circulation study in Dungeness Bay under a grant from the EPA.

- *Clallam Conservation District*

  Clallam Conservation District (CCD), under the authority of Ch. 89.08 RCW, works cooperatively with landowners and land occupiers to conserve renewable natural resources. CCD is a non-regulatory subdivision of state government. Much of CCD's resources are devoted to helping land users develop and implement farm plans to protect water quality and improve fish and wildlife habitat. In addition to one-to-one assistance to farm operators, CCD provides more general education and technical assistance to residents, including workshops on such topics as land stewardship for horse owners and landscaping with native plants. They are also able to provide financial assistance for implementation of best management practices.

  Landowners receiving a Notice of Correction from Ecology will normally be referred to CCD for assistance. When developing farm plans, CCD uses guidance and specifications from the U.S.D.A. Natural Resources Conservation Service. The programs of CCD are funded almost entirely by grants from the state and federal government. CCD currently has six grants through the Washington Conservation Commission, two grants through the Department of Ecology, and one grant from the Salmon Recovery Funding Board to help with implementation activities in the Dungeness watershed. Clallam County provides limited funding to CCD to carry out its programs.

- *Clallam County*

  Clallam County regulates land use in the lower Dungeness watershed. In response to shellfish harvesting restrictions in Dungeness Bay and water quality issues in freshwater in the watershed, Clallam County formed the Sequim-Dungeness Clean Water District. The District was adopted by ordinance in June 2001. The County facilitates the associated Clean Water workgroup, and was the lead in developing the Clean Water Strategy.

  Clallam County regulates on-site septic systems in accordance with Ch. 246-272 WAC and Clallam County Health Regulation Chapter 4, On-site Sewage Systems. The County's computerized permit tracking system contains septic system permit information since about 1988. As part of their on-site operations and maintenance program, new systems as well as repairs and sanitary surveys are recorded. They issue permits for new and repair/replacement systems, provide on-site system owner public outreach workshops, distribute informational materials to homeowners, and respond to complaints.

  The County has also been a partner in monitoring efforts, conducting special studies, supporting the work of the Streamkeepers, and providing laboratory analysis for partnership studies as funding allows.

- *Clean Water Workgroup*

  The Workgroup includes representatives of agencies and groups that have responsibility or interest in water quality and shellfish issues. The purpose of the Workgroup is to implement the *Clean Water Strategy*, and integrate responses for Dungeness Bay and the lower Dungeness River. The Workgroup meets approximately monthly to coordinate priorities, activities and resources.

- *Washington State Department of Health*

  The Department of Health (DOH), under authority of Ch. 43.70 RCW, monitors marine water quality in commercial shellfish growing areas of the state, including Dungeness Bay. DOH has restricted commercial shellfish harvest in areas of the Bay due to fecal coliform levels in excess of public health-based water quality standards. DOH continues to monitor water quality in the Bay six times/year.

- *Washington State University Cooperative Extension*

  Washington State University Cooperative Extension provides public workshops on best management practices for livestock and other agricultural activities. They have collaborated with the CCD to develop a demonstration farm at Clallam County's Robin Hill Farm Park to showcase sustainable farming practices and systems that protect water quality, conserve water, and enhance the local environment. They also participate in the Clallam County Fair and other public events.

- *Puget Sound Water Quality Action Team*

  The Puget Sound Water Quality Action Team, under authority of Chapter 90.71 RCW, works with governments and organizations across the region to carry out the Puget Sound Water Quality Management Plan. Under different parts of the plan, agencies and governments provide technical and financial assistance to control pollution from septic systems, farm animal wastes and stormwater runoff in the Dungeness River watershed. Support staff of the Action Team assist directly with programs to protect and restore shellfish harvesting in Dungeness Bay. The Action Team also administers grant funds for public involvement and education projects.

- *Dungeness River Management Team*

  The Dungeness River Management Team (DRMT) is a partnership of individuals and stakeholders in the Dungeness River Watershed who are working together to develop and implement locally based, long-term solutions to watershed management issues. Some of these include degraded fish habitat, especially related to endangered/threatened stocks of salmon (under the Endangered Species Act), flooding, bank erosion and property damage, excessive sedimentation, water conservation, and water quality and quantity problems. The DRMT meets monthly to discuss these issues and others, to describe problems in the watershed, and to define possible solutions and opportunities, using past and current data and scientific information, along with a cooperative exchange of ideas.

The Clean Water Workgroup serves as the water quality subcommittee for the DRMT.

- *Citizens of the lower Dungeness River watershed*

  The citizens of the watershed are the most "involved party" in this TMDL. The water quality issues involved are all nonpoint. That means pollution originates from a number of sources throughout the watershed rather than from one "point source," such as a discharge pipe at a sewage treatment plant. Improvement in water quality will ultimately happen because citizens throughout the watershed improve the conditions on their land that contribute to fecal coliform contamination.

Approaches to Meet Load Allocations

The first step is to identify potential sources, either by monitoring results or from other available information.

Agricultural sources of fecal coliform bacteria are being addressed through education/outreach activities and technical assistance conducted by the CCD and Washington State University Cooperative Extension. CCD works with land users to develop farm plans and implement conservation practices. They have specifically worked with landowners in reaches shown through monitoring to be sources of fecal coliform. The CCD provides cost-share funding to landowners and directs landowners to other financial assistance programs for implementation of best management practices.

The CCD is also involved in a larger program underway in the watershed to help irrigation districts and companies replace open irrigation ditches with pipelines as a measure to improve water quality as well as conserve water. The CCD has targeted piping in the Matriotti Creek area, where monitoring results have shown particularly high fecal coliform levels. Contaminated irrigation tailwater from three ditches in the Matriotti Creek area has been completely eliminated within the past year.

Education and technical assistance are the preferred way to address agricultural sources of fecal coliform bacteria. In addition, Ecology is working with farms that have a high potential to pollute. Farm owners are given the opportunity for assistance from the CCD through formal referrals (Notices of Violation). Enforcement orders and penalties are expected to be necessary only in situations where education and technical assistance efforts fail to get pollution controls in place.

Clallam County's Environmental Health Division regularly responds to complaints regarding suspected on-site septic system failures. Property owners are contacted, given technical assistance and inspections are conducted, if needed. Clallam County has compiled information on areas where water monitoring indicates likely septic failures, and a short-term plan for remediation is being considered by the Clallam County Board of Health. Landowners in water quality problem areas will be involved in identifying solutions in neighborhood meetings as part of the public involvement on this TMDL. Landowners identified as having a septic of concern in water quality problem areas will be contacted directly by the County. The County also

conducts general education/outreach activities including Septic 101 public workshops, publishing the *Clean Water Herald,* and periodic special events such as watershed tours.

Wildlife sources of fecal coliform to freshwater are being considered. However, options for managing this source are limited. The approach for meeting TMDL load allocations focuses on human-related sources that can be controlled. This approach may be able to alleviate most of the water quality concerns. If it is not enough, management options for areas of high wildlife concentrations in the watershed can be explored. For instance, technology, like mycoremediation (which uses mushrooms to "eat" bacteria), may be useful in removing some wildlife sources.

The ongoing circulation study in Dungeness Bay will result in a TMDL for the Bay in 2003. It will provide additional information on fecal coliform sources and loads to the Bay. Continued monitoring in freshwater by the Tribe, County, and Ecology will also provide additional information on trends and sources. Part of the challenge to meeting load allocations will be keeping up with population growth. Adjustments to approaches will be made if new information indicates that need.

Under the terms of the 1997 Memorandum of Agreement between EPA and Ecology, a detailed implementation plan must be developed within year of EPA's approval of this submittal package. The *Clean Water Strategy* meets most of the requirements of a detailed implementation plan. One outstanding but essential element of the detailed implementation plan will be to define success measures. The primary success measure will be fecal coliform bacteria reductions. Other measures will also be discussed and proposed for inclusion.

Implementation Activities

Please refer to page 10 of the *Clean Water Strategy*, Appendix A, VII. Overall Strategy.

Reasonable Assurances

There is considerable commitment to improving water quality in the lower Dungeness River watershed. Progress has been made since the technical study was completed in 2000: CCD has eliminated tailwater return from three ditches to Matriotti Creek (the area identified in the technical study as the most significant source of fecal coliform bacteria); the County has continued to conduct and develop their on-site program, and are considering options for high risk areas; Ecology has nearly completed a compliance "sweep" of agricultural operations of concern; a variety of public outreach activities have been conducted; and monitoring efforts continue.

With the creation of the Sequim-Dungeness Clean Water District, Clallam County formalized the commitment to improving water quality. The members of the Clean Water workgroup will continue to evaluate progress and priorities, and coordinate activities. Agencies will pursue the regulatory authorities identified in the above section, Involved Parties and Regulatory Authorities. And, as funding allows, additional activities from the *Clean Water Strategy* will be implemented.

Adaptive Management

The workgroup will continue to evaluate ambient, source identification, and effectiveness monitoring data and make appropriate adjustments to management strategies. In 2003 the circulation study of the Bay will be completed, providing additional information about bacteria in the Bay and effects on shellfish harvest areas. The Workgroup may make adjustments to management strategies or load allocations based on that information.

Monitoring Strategy

Please refer to page 21 of the *Clean Water Strategy*, Appendix A, IX. Actions to be taken and projected timelines, Table 2, Source Assessment.

Additional monitoring will be considered if necessary for source identification or for determining if TMDL target loads are being met.

Potential Funding Sources

Please refer to page 19 of the *Clean Water Strategy*, Appendix A, IX. Actions to be taken and projected timelines, Table 2.

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Appendix A

Clean Water Strategy for Addressing Bacterial Pollution in Dungeness Bay and Watershed

Clean Water Strategy
For Addressing Bacterial Pollution in Dungeness Bay and Watershed

June, 2002

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I. Introduction

This strategy, which is an update of the November 21, 2000 Clean Water Strategy incorporated by reference in CCC 27.16 (See Appendix A), addresses the management of bacterial pollution in the Dungeness Watershed and Bay. The purpose of this *Clean Water Strategy* is to coordinate and guide actions that will ensure improvement and long-term protection of water quality. This update incorporates new implementation activities and is included in WA Department of Ecology's implementation plan , as a part of its water clean-up plan for Matriotti Creek, the lower Dungeness River and tributaries to Dungeness Bay. It also extracts information from the previous document, *Dungeness Bay Shellfish Closure Prevention Response Strategy*, developed in 1997, as well as the Dungeness Bay Watershed Management Plan (adopted in 1994).

II. Goals of the Clean Water Strategy

The goals of this strategy are:

- To protect public health
- To identify and correct sources of bacterial contamination associated with human activities that are impacting water quality of Dungeness Bay
- To restore and maintain water quality in the freshwater ditches, streams and river and in marine waters within the bay
- To re-open areas closed to commercial shellfish harvest and prevent future closures
- To continue to harvest shellfish for commercial, subsistence and recreational purposes
- To protect habitat for shellfish and other wildlife species

III. Background

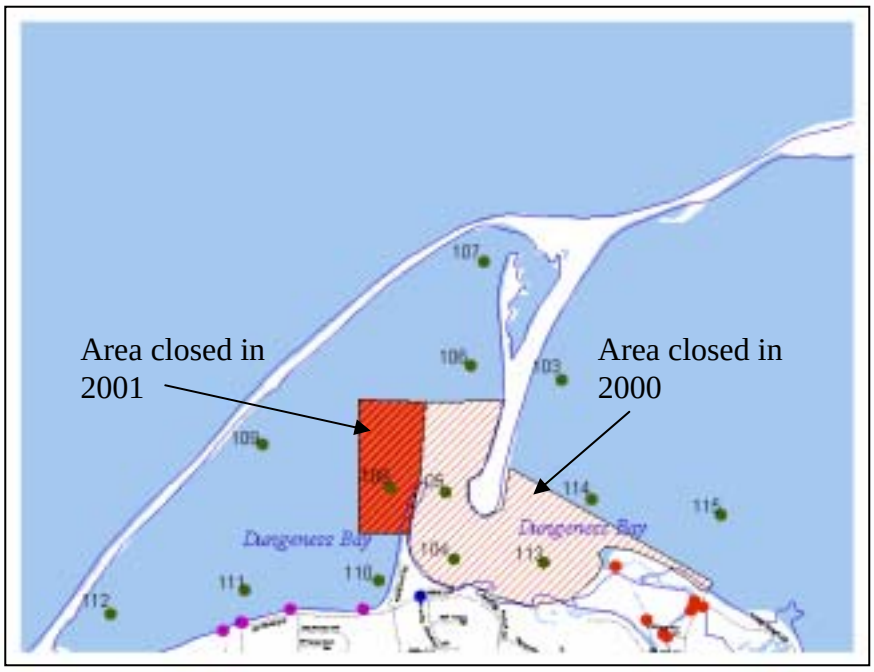
According to the US Census Bureau, Clallam County has experienced growth in the unincorporated, rural areas of the county. Between 1990 and 2000, unincorporated Clallam County grew by 16%, most of it concentrated in the eastern part of the county. This increased growth is creating pressures on water quality, particularly in the Dungeness Watershed where the relatively dry climate of the Olympic rainshadow attracts newcomers to the area. As a result of land-use changes and ongoing releases of fecal coliform into streams and ditches, water quality in both fresh and marine waters has deteriorated.

The symptoms of poor water quality are increasingly evident in the Dungeness Valley. Johnson, Bell, Cassalery, Matriotti, and Bagley creeks are on the Washington Department of Ecology's (Ecology) 303(d) list for bacterial contamination. Under the federal Clean Water Act, section 303(d), every two years Washington State has to submit to the US Environmental Protection Agency (US EPA) a list of surface water bodies that fall short of water quality standards and are not expected to improve within the next two years. In addition, effective May, 2000, the Washington Department of Health (Health) closed 300 acres of Dungeness Bay to commercial shellfish harvesting because concentrations of fecal coliform bacteria exceeded the State and Federal water quality standard. In May 20001, Health added another 100 acres to the closure area due to poor water quality.

Water Clean-up Plan
Ecology is required to complete a *Water Clean-up Plan* for all 303(d) listed water bodies. The plan is composed of a *Total Maximum Daily Load* (TMDL) *Study and an Implementation Plan*. As a result of the 303(d) listing of and high funding priority for Matriotti Creek, Ecology conducted the Dungeness River and Matriotti Creek Fecal Coliform Bacteria TMDL Study, from 1999 to 2000. The study identifies bacterial contamination in the freshwaters that flow into the Dungeness Bay. This *Clean Water Strategy* will be a part of the *Ecology's Implementation Plan*.

Shellfish Downgrade
For years, Dungeness Bay has been certified by Health as *Approved* for commercial shellfish harvest. Since 1997 Dungeness Bay has been experiencing increases in fecal coliform bacteria. In 2000, 300 acres and in 2001, 100 acres of Dungeness Bay were reclassified by Health from *Approved* to *Prohibited* for commercial shellfish harvest (see Figure 1). The shellfish area was downgraded because fecal coliform levels in the bay did not meet National Shellfish Sanitation Requirements for water quality in commercial shellfish harvesting areas. The closure area extends west from the tip of Cline Spit; the northern boundary is marked by a piling (approximately 48° 09' 31.84' N, 123° 08' 57.62). Finally, the closure boundary extends east (including the eastern shoreline of Cline Spit) to the row of pilings near the end of Sequim-Dungeness Way, approximately one hundred feet from shore (See Figure 1). See Appendix B for a list of those parties presently affected by the shellfish downgrade.

Figure 1: Area in Dungeness Bay that is closed to shellfish harvesting.



IV. Shellfish Downgrade Requirements

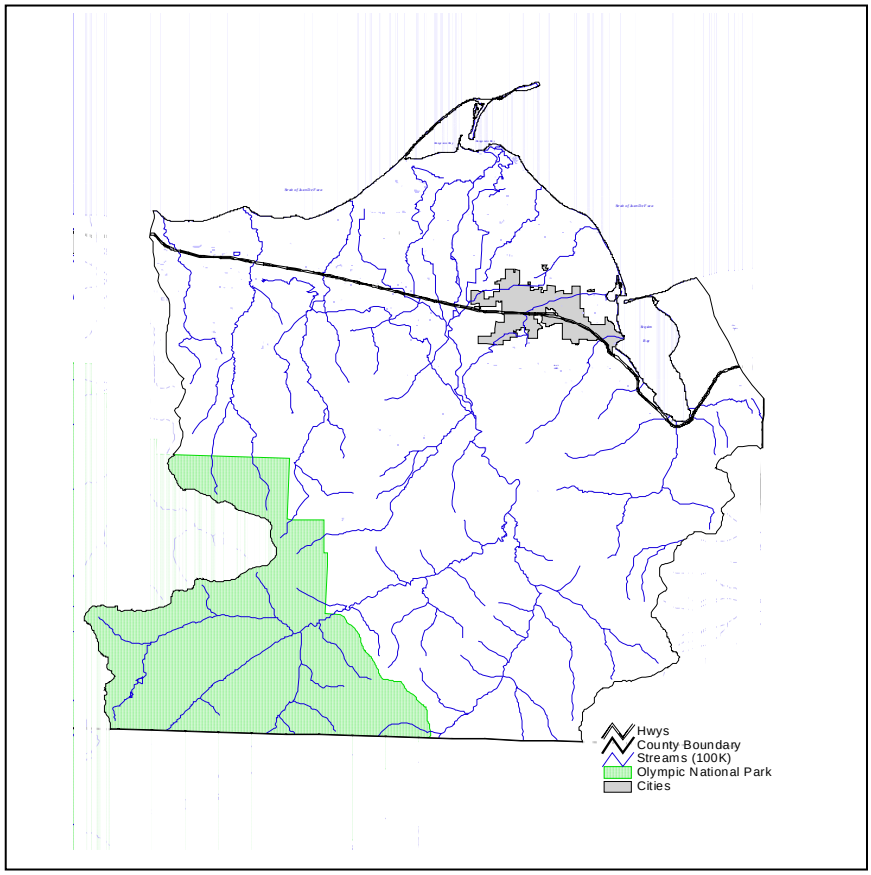
Under the 1994 *Puget Sound Water Quality Management Plan*, Washington Dept. of Health (Health) is required to initiate a closure response process following the downgrade of a shellfish area. Health convenes a Response Team consisting of state and local agencies, tribes, impacted shellfish harvesters and other interests. The Response Team identifies a lead agency, then the Team works together to develop and implement a strategy to restore water quality in the affected area. Clallam County agreed to act as the lead entity to develop a response plan. This *Clean Water Strategy* for addressing fecal coliform in Dungeness Bay and its watershed has been written with the input and assistance from the Clean Water Workgroup, formerly called the Response Team. A detailed description of the Clean Water Workgroup and its members are found in Section VIII.

In addition, this shellfish restriction requires Clallam County to form a shellfish protection district pursuant to RCW 90.72.045. On October 11, 2000, a recommendation was made by the Dungeness River Management Team (DRMT) to the Clallam County's Board of Commissioners to call the shellfish protection district a "Clean Water District" and to have its boundaries be the same as the management area of the DRMT (see Appendix C for a copy of the letter). The DRMT management area includes the Dungenesss watershed and those waters influenced by it through the irrigation system and the Sequim Bay watershed.

The Sequim-Dungeness Clean Water District was formed by the Board of Clallam County Commissioners in June 2001, by ordinance CCC. 27.16. The legal boundaries of the Clean Water District include the following areas within Clallam County: the Dungeness Watershed and those waters influenced by it through the irrigation system, and other independent tributaries to the Strait of Juan de Fuca, from Bagley Creek east to, and including, the Sequim Bay Watershed (See Figure 2).

The DRMT, also recommended that the Clean Water District cover a full range of water quality problems being experienced in the Sequim-Dungeness Watershed. Other known water quality problem areas are detailed in Appendix D. Generally, bacterial pollution is a concern in some streams/ditches that drain to the Strait of Juan de Fuca and Sequim Bay. Stormwater is a concern in the Johnson and Bell Creek watersheds. Sequim Bay has a shellfish closure due to bacterial pollution (at the mouth of Johnson Creek). Further there are documented groundwater quality problems affecting well owners in the Agnew area and general concern about groundwater impacts in the Carlsborg Urban Growth Area.

Figure 2: Clean Water District Boundaries



V. Ecosystem at risk

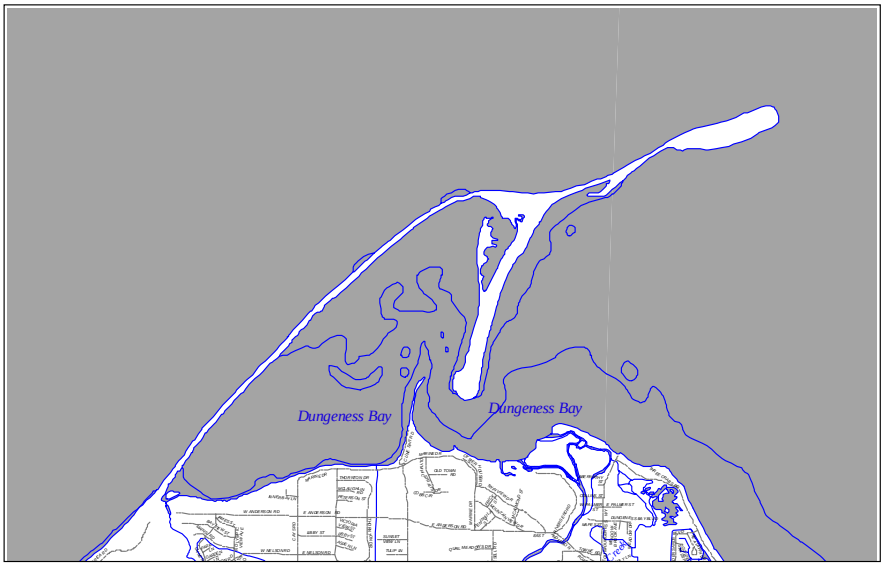
A critical estuary, Dungeness Bay supports eelgrass beds, as well as populations of shellfish, fin fish, marine mammals and birds. The bay includes a national wildlife refuge, which is a critical stopping point on the Pacific Flyway for migratory birds and a tourist destination of great economic importance in Clallam County. It is an important location for recreational harvest of crab and clams, as well as the source of commercial harvest of crab and the site of two commercial shellfish farms. Three Native American Tribes have treaty rights to harvest finfish and shellfish within Dungeness Bay.

Tourism, agriculture, retirement income, fisheries and forestry make up the economic base of the watershed area, with an emphasis on tourism and agriculture. Over 40% of homes in the area are located on or near a water body, whether it be the Strait of Juan de Fuca, streams, wetlands or

irrigation ditches. In all cases, residents enjoy the water resources of the watershed, whether for aesthetics, drinking water, benefits from industrial-use and agriculture, fishing, boating, wildlife viewing or watering their gardens. Water resources and associated benefits are an integral part of their lives.

Dungeness Bay is located along the south shore of the Strait of Juan De Fuca, approximately 20 miles east of Port Angeles. A hook-shaped sand spit, extending approximately five miles northeast along the shoreline, forms the bay. Dungeness Bay (see Figure 3) is divided into an inner and outer bay by a 1.3-mile long offshoot of the sand spit that extends southward back towards the shoreline (Graveyard Spit), and another spit that extends northward from the shoreline (Cline Spit). The Dungeness River drains to the bay. Matriotti and Hurd Creeks are tributaries to the lower Dungeness River. Meadowbrook creek and slough enter the outer portion of Dungeness Bay, east of the mouth of Dungeness River. In addition, a few irrigation ditches and a small stream discharge directly into inner Dungeness Bay.

Figure 3: Dungeness Bay



In the upper Dungeness River, Mount Deception is the highest point in the Dungeness River's watershed and forms the southwestern boundary. The watershed topography includes three distinct areas: mountains, foothills, and the coastal fan adjoining the bay and the Strait of Juan de Fuca. The mountain area includes steep, forested lands within Olympic National Park and Olympic National Forest. The agricultural and residential areas in the northern portion range from are gently rolling to nearly flat.

Approximately one hundred and seventy-two miles of canals and laterals (irrigation ditches) flow through the Dungeness watershed, diverting water from the Dungeness River to agricultural and residential lands. The City of Sequim supplements its groundwater municipal supply with Dungeness River water. Watershed residents also use groundwater for their drinking water. The Dungeness watershed contains a diverse array of land uses and vegetative cover. Land uses include pasture, hayland, and cropland on both commercial and small farms, medium and low density residential development scattered throughout the lower watershed, private, public and public trust (State) forestland in the upper watershed, as well as a large portion of the Olympic National Forest and Olympic National Park.

Impacts from fecal coliform pollution

The variety of impacts from bacterial pollution in the watershed and Bay range from increased public health risk to decreased economic potential. Most importantly, bacterial pollution presents an increased health risk to residents and visitors to the area. Fecal coliforms are used as an indicator of bacterial waste and are types of bacterium found in the feces of warm-blooded animals (e.g., humans, birds, and livestock). Most fecal coliform bacteria are not harmful, but their presence is used to indicate the potential for a variety of disease-carrying microorganisms, known as pathogens. If present, these pathogens are also transported in human and animal feces and can cause illnesses in humans ranging from stomach upset to more serious diseases, like hepatitis and typhoid. Increased amounts of fecal coliform in surface water indicate an increased chance that pathogens are in the water.

Humans are exposed to pathogens when wading or swimming in water and when we eat contaminated shellfish. People are exposed to pathogens when water is swallowed (via splashing or hand to mouth contact) or when water comes into contact with open cuts or wounds. Pathogens enter into the shellfish (oysters, clams and mussels) as they filter the water for food. There is concern that some people will continue to harvest shellfish in the closed area, either unaware of the posted closure or simply ignoring the closure signs. These people will have an increased risk of illness, if they eat shellfish.

The closure of shellfish harvesting within Dungeness Bay decreases economic potential within the local community. The direct commercial impacts from the harvesting closure include:

- Loss of productivity of all tidelands farmed by Northwest Corner Oyster Company,
- Loss of one-third of the area farmed for shellfish by Jamestown Seafood, Inc., including the loss of the company's wet storage, where shellfish may be held for a short time before sent to market, and
- Reduction in the lease value of tidelands owned and leased out by the Port of Port Angeles and the Washington State Department of Natural Resources.

In addition, the closure results in a loss of harvest opportunity by residents and visitors, due to the official closure of the tideflats at the Dungeness boat ramp and recreational areas within the Dungeness Bay Wildlife Refuge. Members and guests of three private organizations (San Juan Duck Club, Dungeness Beach Association, and Dungeness Farms) with tidelands no longer have the opportunity to harvest shellfish. Finally, high levels of bacteria in the streams, river and bay tarnish the "pristine" reputation the Dungeness Bay and Dungeness River, which could affect tourism to the area.

VI. Assessment of Fecal Coliform Sources

Determining the sources of fecal coliform bacteria in our water is difficult, because the bacteria are not specific to one, but a variety of, possible influences. Humans, livestock, pets, birds and marine mammals all contribute some amount of bacteria to the streams and/or bay. Examples of possible fecal coliform sources include:

- Septic systems failing near ditches, streams, rivers and along the edge of the bay;
- Livestock and pets defecating in and near ditches, streams, rivers and along the edge of the bay;
- Wildlife in the freshwater and marine environment;
- Uncontrolled untreated stormwater from farms, lawns, and impervious surfaces (e.g., pavement).

Although not considered a pollution source, the lack of native vegetation along ditches and stream banks limits the landscape's ability to filter contaminated run-off.

Identification and control of fecal coliform sources in the freshwater ditches, streams and river are difficult since their waters are almost always in motion. Water sampling of streams sometimes indicates high amounts of fecal coliform on one day, whereas, on another day, amounts may be low. There are two main reasons for this inconsistent pattern of fecal coliform presence. First, the release of fecal coliform into the water is intermittent. For example, large numbers of livestock and horses in the water add fecal coliform more often than an occasional one or two animals in the stream. Failing septic systems, near or directly connected (illegally) to the ditch or stream, pulse untreated water into stream or ditch water. Wildlife is present in different areas of the watershed at different times. Second, natural variability adds another layer of complexity in determining the exact location of fecal coliform inputs to water. Ditches, streams, the Dungeness River and bay are constantly in motion, moving water (and things in the water) around the environment. Environmental conditions in water bodies also change by the month, season and year.

Several efforts to identify pollution sources and the extent of their impact on the freshwater and in Dungeness Bay are ongoing. Assessment of pollution sources has been and continues to be a collaborative effort among local and states agencies. Information on the current knowledge of bacteria pollution sources in the freshwater ditches and streams and in Dungeness Bay is provided below.

Freshwater Streams and Ditches that flow into Dungeness Bay

In partnership with the Jamestown S'Klallam Tribe and Clallam County, WA Dept. of Ecology (Ecology) led a Total Maximum Daily Load (TMDL) Study on the lower Dungeness watershed. The overall goals of the TMDL project were to characterize fecal coliform pollution and develop a plan to reduce this pollution to protect the beneficial uses of surface water.

The objectives of the TMDL study were to:

- Characterize fecal coliform bacteria concentrations and identify major bacterial loading sources along Matriotti, Meadowbrook, and Hurd Creeks and the lower Dungeness River.
- Determine maximum acceptable fecal coliform loads and concentrations allowable at the mouth of the Dungeness River to meet marine standards at WA Dept. of Health's marine station, #113, at the mouth of the River.
- Determine maximum acceptable fecal coliform loads and concentrations in Matriotti Creek to meet the TMDL targets in the Dungeness River.
- Determine the percent reduction in bacteria needed to meet the above water quality targets.

Ecology began water monitoring in 1999 and finished collecting data in 2000. The report, *Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study*, outlines the study's results. Please refer this report for complete details. Below are some highlights from the study.

- Washington State water quality standards for the Dungeness River (Class A standards) are insufficient to protect shellfish harvesting water quality requirements, in accordance with the National Shellfish Sanitation Program. In order not to contribute to poor water quality in Dungeness Bay, the mouth of the Dungeness River needs to meet shellfish growing water standards.
- The Dungeness River meets shellfish growing water standards at Woodcock Road. Bacterial pollution is added downstream by Matriotti Creek and other sources along the river. At its mouth, the River doesn't meet shellfish growing water standards.
- Matrotti Creek is still a significant contributor of bacterial pollution to the Dungeness River.
- Meadowbrook Creek and the Golden Sands area fail to meet Washington State water quality standards.
- Sources of bacterial pollution vary between the irrigation season (April – September 2000) and the wet season (November 1999 – March 2000). Matriotti Creek doubles its bacterial contribution to the Dungeness River during the irrigation season.
- Downstream from the Schoolhouse Bridge, bacterial pollution in the Dungeness River is significantly higher during the wet season, November through February.

Follow-up water monitoring is planned for Matriotti Creek, the Dungeness River and Meadowbrook Creek and Slough by the Jamestown S'Klallam Tribe and Clallam County. This information will be important in identifying water quality trends and measuring the effectiveness of remediation activities.

The Clallam Conservation District has sponsored the Streamkeepers volunteer monitoring program in monitoring water quality in several irrigation ditches in the Sequim-Dungeness Watershed. The results of this monitoring effort has helped identify which ditches are the most problematic and is used to determine the highest priority ditches for piping. Initial sampling results show that some irrigation ditches have high counts of fecal coliform that exceed Clean Water Act standards. Many of these ditches enter into streams within the watershed, including Matriotti Creek.

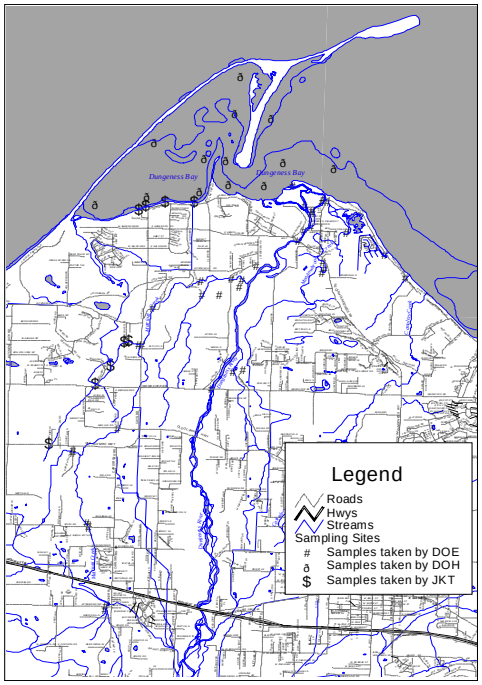
Marine Waters in Dungeness Bay

A study, which is expected to be completed in 2002, of fecal coliform sources to and in Dungeness Bay is underway. . The Jamestown S'Klallam Tribe, using US EPA funds, hired Rensel and Associates in 2000 to investigate water circulation and fecal coliform sources and losses within the marine waters of Dungeness Bay. A description of the first part of this study is available in the report, *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies, August 2001*. Overall, the entire study of the Bay will include a:

- Bathymetry Study (water height at different tidal stages) of Inner Dungeness Bay
- Circulation Study of the inner and outer bay
- Fecal Coliform budget (losses and gains) for inner Dungeness Bay
- Vertical distribution study of fecal coliform
- Reflux study (the amount of water that moves in and out of the Bay with the tides)
- Study of fecal coliform bacteria die-off (how quickly the bacteria die in the waters of the Bay).

Waste contributed by warm-blooded wildlife is being considered, both in the watershed and the Bay, as a part of our assessment of fecal coliform sources. The ongoing study of the Bay is tracking the circulation of water and taking fecal coliform samples where there is input of wildlife waste. Results from the Dungeness Bay study are forthcoming in late 2002.

Figure 4: Locations of Fecal Coliform Sampling Stations



Note: DOE – Washington State Department of Ecology
DOH – Washington State Department of Health
JKT – Jamestown S'Klallam Tribe

VII. Overall Strategy

Although wildlife inputs are being considered in assessing the sources of bacterial waste, Clallam County and other entities implementing remediation are focusing their efforts on land-based activities which can be addressed through education, wise-use and best management practices, regulation and enforcement. Given the 16% increase in unincorporated Clallam County from 1990 to 2000 (Census 2000), remediation activities have focused on human-influenced sources of bacterial waste, like septics, pets, horses, cows. Remediating human-influenced sources of bacteria waste may improve water quality in the freshwaters, and perhaps in Dungeness Bay.

The overall strategy for identifying, addressing and removing sources of fecal coliform will build on previous and current technical assessments mentioned previously in this document. Actions resulting from this strategy will be coordinated with the Board of Clallam County Commissioners and the Dungeness River Management Team (DRMT). The strategy addresses three components :

- Pollution source remediation,
- Public outreach, and
- Additional source assessment

The timely implementation and effectiveness of the strategy elements discussed below is heavily dependent on funding and personnel availability.

A. Pollution Source Remediation

Controlling or remediating sources of fecal coliform in the watershed will be closely linked with water quality sampling results and observation of the land uses in the area. Most likely, there will be different pollution sources affecting different ditches and streams. In one area, the fecal coliform sources may be failing septic systems, and in another area, the source may be horses in the stream. The most effective approach to controlling fecal coliform sources will start in areas with high fecal coliform counts, and removing the obvious sources of fecal coliform, moving towards the less obvious sources, and using additional assessments, if necessary.

Sewage Disposal

On-site septic systems that are inadequately designed, installed or maintained are often a common source of both surface and groundwater contamination. Either by outright discharge into a surface water body or through treatment failures impacting underlying groundwater, the proper operation and maintenance of on-site septic systems is vital to the health of our watersheds. In 1999, the Clallam County Environmental Health Division (CCEHD) incorporated recommendations from the Operation and Maintenance Advisory Committee along with local and state staff's feedback to create Clallam County's On-Site Septic System Operation and Maintenance (O&M) Program Plan. This plan identified eight objectives to a successful O&M program:

- Educate and inform the public,
- Develop a monitoring/inspection program,
- Continue efforts to develop a data tracking system,

- Identify pilot project areas (Dungeness was identified as the highest priority),
- Evaluate the program's success,
- Develop appropriate policies and regulations,
- Identify stable funding sources, and
- Build partnerships.

Proceeding with several of the plan's objectives, in 1999, CCEHD embarked on an ambitious on-site septic system homeowner educational campaign. A campaign was designed to raise awareness about the many benefits of septic system maintenance. Using a variety of approaches and media (e.g., radio, television and written materials), CCEHD promoted a common educational theme, "Does your Flush Rush to the Sea?", with corresponding logo. This theme was used in an 8-page informational septic system maintenance newspaper insert that was distributed to over 45,000 homes including the Dungeness, Agnew and Carlsborg areas.

A class on basic septic system maintenance, called Septics 101, was designed to educate the public about proper on-site septic system operation and maintenance. The 2.5 hour class is designed for the average homeowner and includes presentations by CCEHD on-site program staff and industry representatives. Each homeowner is given a packet of information, including a copy of their system's, as-built (if on record). In 2000/01, eight of these classes were held in the Dungeness Bay area, with a total of 226 homeowners in attendance. In 2002, six classes have been or are scheduled in the Dungeness Bay area

In 2001, the CCEHD was approved to hire an Operation and Maintenance Specialist to assist in implementing an effective O&M program for the Clean Water District, Carlsborg, and other areas of special concern. To address potential on-site system problems in water quality problem areas, a short-term plan has been proposed to the Clallam County Board of Health. This plan encourages voluntary action by landowners through cost-sharing incentives. The details of this plan are outlined below. Should a voluntary approach fail to generate effective remediation, CCEHD will re-evaluate the program's direction, which may include mandatory inspections of on-site systems identified as a "Septic of Concern", in the survey described below.

1. Office Survey of On-site Systems

Using the results from Ecology's TMDL study and parcel information on Clallam County's base map, all parcels adjacent to water quality problem streams and areas where identified. The problem areas examined in this survey include Matriotti Creek, Meadowbrook Creek and Slough and the Golden Sands area. The lower Dungeness mainstem river (downstream of Schoolhouse Bridge) is a problem area, identified in the TMDL. A grant has been requested by Clallam County for land acquisition from willing landowners in the Rivers End road area..

Using the Clallam County Assessor Database and the Department of Community Development (DCD) Permit Plan database and central files, septic permits and other information were reviewed for those identified parcels. Factors that indicated a **"Septic of Concern"** include:

1) Age: 10 yrs or older
2) Repairs made to on site system, with a lack of receipts to indicate repairs were made.
3) No septic permit on file or no septic information available
4) No recent sanitary survey completed or sanitary survey indicates:
    a) Lack of pumping history
    b) Repairs needed
    c) No recovery time
    d) System difficult to evaluate due to overgrowth

Each problem area's parcel research was compiled and is stored in one of four binders. The binders are kept with the Environmental Health Division for review and update. In addition, an Access database was developed for tracking remediation activity electronically.

The three water quality problem areas (used in the survey) were prioritized based on their contribution to bacterial waste loading to Dungeness Bay. The results of the survey and the ranking of priority areas are outlined below.

a. Matriotti Creek (including Mudd Creek Tributary)
    - Highest priority area based on fecal coliform loading
    - 154 parcels identified as adjacent to surface water
    - 59 parcels were identified as having a septic of concern
b. Meadowbrook Creek and Slough
    - Second priority area
    - 60 parcels identified as adjacent to surface water
    - 29 parcels were identified as having a septic of concern
c. Golden Sands Area
    - Third priority area
    - 124 parcels identified as adjacent to surface water
    - 36 parcels were identified as having a septic of concern

2. Community Awareness and Involvement

For all parcels adjacent to water quality problem areas (Matriotti, Meadowbrook and Golden Sands), neighborhood meetings are scheduled for April 2002. These meetings are offered as a part of Ecology's Water Clean-up Plan to:

a. Present and discuss TMDL study results
b. Discuss possible sources to problem areas with Ecology, Clallam County and Clallam Conservation District
c. Brainstorm for solutions with affected landowners

Following the neighborhood meetings, CCEHD will initiate direct communication with those landowners with an identified Septic of Concern, starting with the highest priority area.

3. Incentives for Voluntary Inspections/Maintenance of On-site Systems

Through a partnership between Clallam County and the Jamestown S'Klallam Tribe, limited funds are available for cost-sharing for parcels identified as a Septic of Concern. Overall, CCEHD will encourage voluntary inspection/maintenance of their septic system by:

(1) Providing as-built information
(2) Providing technical assistance
(3) Providing limited cost-sharing to inspect their system and install risers for easy future access
   a. $30,000 funded through the Jamestown S'Klallam Tribe by an EPA grant
   b. Cost sharing financial assistance for parcels with identified septics of concern located in Matriotti Creek, Meadowbrook, and Golden Sands areas
   c. Each parcel will be reimbursed up to $250 for the following:
      - Excavation of tank & installation of inspection risers
      - Inspection of septic system (System must be inspected by a professional licensed Designer)
   d. If a Septic of Concern has had an inspection within the past year, and has already installed risers, then parcel owner may be reimbursed up to $250 for the following:
      - Tank pumping (System must be pumped by a licensed professional pumper)
      - System repairs (must be designed and installed by licensed professionals, unless repair is of minor nature)
      - Designer/Installer fees (Must be licensed professionals)

Animal-Keeping Practices

In the spring of 2001, Department of Ecology sent approximately 60 letters to landowners notifying them of possible water quality concerns on their properties. Several landowners were referred to the Conservation District for assistance. Some landowners have implemented their own solutions and a few landowners are working directly with the Ecology Enforcement Officer.

The Conservation District is currently working with eight landowners to develop plans to protect surface water quality on their properties. Plans not only provide the landowners with detailed information about their property, such as soil type and water features, but they also provide land management alternatives based on Best Management Practices (BMPs). The Conservation District has helped landowners implement BMPs such as:

- developing manure management systems,
- installing gutters and downspouts on farm buildings,
- fencing livestock out of riparian areas and wetlands,
- designing rotational grazing systems, and
- creating mud-free pens to confine animals in during the winter months.

The Clallam Conservation District has a Cost-Share Program that covers up to 75% of the costs associated with implementing BMPs that protect water quality. Clallam Conservation District also helps landowners comply with the Clallam County Critical Areas Ordinance and is currently helping 5 landowners develop a variety of conservation and restoration plans that protect water

quality. The Conservation District also assists local dairy farms with the implementation of BMPs outlined in their Dairy Nutrient Management Plans.

The Clallam Conservation District will continue to develop and implement farm plans and best management practices to address improper animal waste and pasture management practices. They will assist in the restoration of riparian and marine shoreline areas damaged through improper agricultural practices. Finally, the Conservation District will continue to install storm water treatment systems, where needed, and continue with piping of irrigation and storm water ditches where appropriate.

B. Public Outreach

Since an informed public is essential to maintaining public health and safety and to minimizing human impacts on water quality, public outreach should be continuous and directed towards specific audiences. The goals of the public outreach strategy are to:

- Provide information on bacterial pollution and controlling it in Dungeness Bay and its related watershed, including the associated human-health risk from bacterial contamination
- Provide a clear explanation to the public about the role and purpose of forming a Clean Water District
- Provide information on other water quality problems within the Clean Water District
- Inform watershed residents where information and services for remediation can be found locally; which state and local agencies are involved in water clean-up and their authority
- Facilitate an understanding among watershed residents about the natural water cycle and their impact on it
- Encourage watershed residents to become or continue to be effective watershed stewards
- Facilitate long-term partnerships among government agencies and community organizations

To meet the above goals, past activities have included:

- Septic 101 workshops (for On-site systems), 1999 & 2000
- Teachers Workshop, February 2001
- Public Meeting, May 2001
- Clallam County Public Hearing, May 2001
- Clean Water District Tour, May 2001
- 2001 Presentations to: Dungeness River Management Team, North Olympic Land Trust, Port Angeles Lions Club, Dungeness Water Users Association and City of Sequim

Planned activities for public outreach include the following:

- Neighborhood meetings for Matriotti Creek, Meadowbrook Creek/Slough, and Golden Sands, April 2002
- Ecology Public Hearing for the lower Dungeness Water Clean-up Plan, April 2002
- Sequim 7th Grade Watershed Week, including a tour with activities, April 2002
- Septics 101, January – May 2002
- Natural Landscaping , April and May 2002
- Horse and Pony Care, May 2002
- Salmon and Wildlife, June 2002
- 2002 Presentations to: Dungeness River Management Team, North Olympic Land Trust, Sequim Rotary Club, Dungeness Water Users Association, City of Sequim and others.

In addition, a newsletter, entitled the *Clean Water Herald* is mailed to Clean Water District residents. Two newsletters have been distributed to date. The first issue (February 2001) discussed the regulatory requirements for establishing a Clean Water District and gave an overview of non point pollution. The second issue (February 2002) discussed the results from Ecology's TMDL study and provided information on remediation activities. Another issue is planned for June 2002 and will discuss community involvement in water quality remediation.

C. Additional Source Assessment

Water quality sampling, following the Matriotti/Dungeness TMDL, will be crucial in implementing this strategy. Follow-up surface water monitoring will provide a useful tool to determine if remediation efforts are improving water quality in problem areas; it also serves as a public outreach tool in keeping watershed residents informed on water quality within the Clean Water District. The three objectives of the follow-up monitoring are to:

- Determine the success of remediation measures on water quality
- Conduct follow-up monitoring in priority streams, and
- Inform the public of water quality conditions.

The Clean Water Workgroup is considering other types of assessment, such as genetic characterization of fecal coliform (or E.coli) bacteria and an analysis of fecal coliform inputs from stormwater conveyances. Currently there are insufficient funds to conduct either of these types' assessments, but grant funds are being sought. More details are provided on methods to identify coliform bacteria by source or by using chemical tracers.

Characterization of fecal coliform (or E.coli) bacteria

Although clean-up efforts are underway to address the obvious contributors of fecal coliform (farms and septic systems), in some areas, there are high fecal coliform counts in the freshwater ditches and streams with no obvious pollution sources. Further, since Dungeness Bay is also a national wildlife refuge that supports populations of marine mammals and birds, there are questions about the contribution of wildlife to the bacterial problem in the marine waters. To determine the origin of fecal coliform contamination in Dungeness Bay and in some of freshwater streams and ditches that flow into the bay, members of the Clallam County Marine Resources Committee, the Dungeness River Management Team and the Public have suggested applying alternative approaches in identifying coliform bacteria sources.

Several different innovative molecular, biochemical and chemical methods have been developed to determine the origin of fecal coliform pollution. These methods have been applied by several local governments in identifying fecal colilform sources in fresh and marine water. These methods include, but are not limited to, the following:

(1) Bacterial Source Tracking methodology is based on identifying and matching microorganisms found at different locations in the environment to their sources, human or other animal, by comparing genetic patterns. The methodology matches ribotypes of bacteria strains from known human and animal sources to those isolated from water samples in the environment.
(2) Antibiotic Resistance Analysis (ARA) is a biochemical method that uses bacterial isolates (*Streptococci* or *Escherichia coli*) from known human and animal sources and analyzes their resistance to various types of antibiotics. Using statistical analysis, patterns of resistance are established for each of the sources, which are then used to identify unknown bacterial isolates taken from water samples in the natural environment.
(3) Optical brighteners from detergents used in the home can indicate a human contribution to water pollution. Also, since caffeine passes through the human digestive system, detection of it in surface waters is useful to determine human contributions to fecal coliform pollution.

In partnership with the Clallam County Marine Resource Committee, the Clean Water Workgroup has discussed the application of these methods to Dungeness Bay and Watershed. Dr. Mansour Samadpour, of the University of Washington, gave a presentation in March 2002 to the Clean Water Workgroup on his Bacterial Source Tracking Method. Currently other methods are being discussed by technical members from the Clean Water Workgroup and the Clallam County Marine Resources Committee.

VIII. Response Team Membership and Coordination with other Watershed Planning Groups

The current group of agencies working on remediating water quality in the Sequim-Dungeness Clean Water District includes those agencies listed under Clean Water District ordinance, CCC 27.16.05. The Jamestown S'Klallam Tribe, Clallam County PUD, US Fish and Wildlife, Battelle Marine Sciences Laboratory and Clallam County Marine Resource Committee members are included, as well. Table 1 lists the Clean Water Workgroup members and their affiliations.

The immediate mission of the Clean Water Workgroup (CWW) is to help implement the *Clean Water Strategy for addressing Bacterial Pollution in the Dungeness Bay and Watershed*. Second to that, the group provides technical and policy advice on a broad range of water resource activities. Since the Board of Clallam County Commissioners is the legislative authority for the creation of a shellfish protection district and implementation of related water clean-up activities, CWW recommendations concerning shellfish resources and related water quality issues within the Clean Water District are directed to the Board of Clallam County Commissioners. However, since the Clean Water District boundary includes more streams than those streams directly

impacting the shellfish resources in Dungeness Bay, other water quality problems should be directed to the entity with the authority to create policy or implement action. The CWW will coordinate activities with other planning groups, such as the Dungeness River Management Team (DRMT) and the Clallam County Marine Resources Committee (MRC). Various members of the Clean Water Workgroup participate on these planning groups. The CWW also serves as a subcommittee to the DRMT and will advise the DRMT of its progress and activities.

Their letters of commitment to conducting actions mentioned in this Strategy are included in Appendix E. This Clean Water Strategy addresses fecal coliform in the freshwaters ditches, streams and river that flow into the marine waters of Dungeness Bay, as well as the bay itself.

IX. Actions to be taken and projected timelines

Table 2 outlines actions that should be taken to remove/remediate pollution sources, direct effective public outreach, and further assess pollution sources. These actions have been discussed in Section VII, Overall Strategy.

Table 1: Clean Water Workgroup Members List

Name		Affiliation
JIM	BAY	CITY OF SEQUIM
TANIA	BUSCH-WEAK	CLALLAM COUNTY ENVIRONMENTAL HEALTH
ANDY	BRASTAD	CLALLAM COUNTY NATURAL RESOURCES
ANN	SOULE	CLALLAM COUNTY NATURAL RESOURCES
VALERIE	WILSON	CLALLAM COUNTY NATURAL RESOURCES
CRAIG	JACOBS	CLALLAM COUNTY PUBLIC WORKS DEPT
KEVIN	RYAN	DUNGENESS NATIONAL WILDLIFE REFUGE
PAM	SANGUINETTI	DUNGENESS NATIONAL WILDLIFE REFUGE
LORI	DELORM	JAMESTOWN S'KLALLAM TRIBE
HANSI	HALS	JAMESTOWN S'KLALLAM TRIBE
LYN	MUENCH	JAMESTOWN S'KLALLAM TRIBE
HUGH	HAFFNER	PUD NO. 1 OF CLALLAM COUNTY
WILL	PURSER	PUD NO. 1 OF CLALLAM COUNTY
CHRIS	HEMPLEMAN	WA DEPT OF ECOLOGY
LISA	ROZMYN	WA DEPT OF ECOLOGY
DEBBIE	SARGEANT	WA DEPT OF ECOLOGY
ANNE	SHAFFER	WA DEPT OF FISH & WILDLIFE
DONALD	MELVIN	WA DEPT OF HEALTH
BOB	BOEKELHEIDE	DUNGENESS RIVER AUDUBON CENTER
JOHN	CAMBALIK	PUGET SOUND WATER QUALITY ACTION TEAM
CURTIS	BEUS	WSU COOPERATIVE EXTENSION SERVICE
MATT	HEINS	DUNGENESS BAY DUCK CLUB
VIRGINIA	CLARK	DUNGENESS RIVER MANAGEMENT TEAM
JOE	SCHMITT	WHISKEY CREEK BEACH RESORT
DANA	WOODRUFF	BATTELLE MARINE SCIENCES LAB
HERB	ARMSTRONG	NW CORNER OYSTER AND AQUA FARM
CLIFF	COMMEREE	NW CORNER OYSTER AND AQUA FARM
MIKE	JELDNESS	SEQUIM-DUNGENESS AG WATER USERS
JENNIFER	COYLE	CLALLAM CONSERVATION DISTRICT
JOE	HOLTROP	CLALLAM CONSERVATION DISTRICT

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Table 2: Dungeness Bay Action Plan				
Action	Assignment	Timeline	Funded?	Funding Source
Pollution Source Removal or Mitigation				
Irrigation ditch piping to reduce input of pollutants to surface water	CCD, Water Users Assoc.	Ongoing	Yes	Conservation Commission
Riparian restoration and fencing to stabilize stream banks and reduce the movement of pollutants	CCD	Ongoing	Partially (inadequate)	WCC & DOE
Develop and implement dairy nutrient management plans	CCD	Ongoing	Partially	WCC
Develop and implement farm plans specifying best mgmt. practices	CCD	Ongoing	Partially (inadequate)	WCC&DOE
On-site septic system investigations	CC	Ongoing	Partially	CC General Fund
Development of On-site O&M Program	CC	Ongoing	Partially	DOE
Ecology enforcement action	DOE	As needed	Yes	DOE

CC: Clallam County
CCD: Clallam Conservation District
MRC: Clallam Co.'s Marine Resource Committee
JKT: Jamestown S'Klallam Tribe
USFWS: US Fish and Wildlife Service
WDFW: WA Dept. of Fish and Wildlife
DOE: WA Dept. of Ecology
HEALTH: WA Dept. of Health
DRC: Dungeness River AudubonCenter
EPA: Environmental Protection Agency

Table 2: Dungeness Bay Action Plan (continued)				
Action	Assignment	Timeline	Funded?	Funding Source
Public Outreach				
Public Hearing for Water Clean-up Plan	DOE	April 2002	Yes	DOE
Neighborhood meetings	DOE, CC, CCD, JKT	April 2002	Yes	DOE
Sequim 7th Grade Watershed Week	RC	April 2002	Yes	EPA
Septic 101 Workshops	CC	January-May 2002	Yes	JKT via EPA
Natural Landscaping Workshop	CCD	April/May 2002	Yes	JKT via EPA
Horse and Pony Care	CCD	May 2002	Yes	JKT via EPA
Salmon and Wildlife Workshop	JKT	2002	Yes	JKT via EPA
Quarterly newsletters mailed to watershed residents about Clean Water District, associated strategies and stewardship activities	CC	2002 and 2003	Yes	CCWF
2002 Presentations to local community groups	CC, JKT	2002	No	
Festival/Fair Booths – shellfish, water quality, on-site maintenance, and riparian protections	CC, CCD, Ecology	2002	Partially	Various sources

CC: Clallam County
JKT: Jamestown S'Klallam Tribe
DOE: WA Dept. of Ecology
EPA: Environmental Protection Agency
CCD: Clallam Conservation District
USFWS: US Fish and Wildlife Service
HEALTH: WA Dept. of Health
MRC: Clallam Co.'s Marine Resource Committee
WDFW: WA Dept. of Fish and Wildlife
DRC: Dungeness River Audubon Center

Table 2: Dungeness Bay Action Plan (continued)				
Action	Assignment	Timeline	Funded?	Funding Source
Source Assessment				
Total Maximum Daily Load Study (TMDL) for Matriotti, Meadowbrook and Dungeness River & Bay	DOE	April 2002	Yes	DOE, JKT
Marine water quality sampling	HEALTH, JKT	Ongoing	Yes	HEALTH, EPA
Water quality sampling of irrigation ditches	CCD, CC	Ongoing	Yes, partially	WCC/CCWF
Circulation Study of Dungeness Bay	JKT	2003	Yes	EPA
On-site system database with GIS mapping, starting with problem areas identified with water quality data	CC	Partially completed for some areas	Partially	CC General Fund
Information/data on wildlife populations and usage with the bay	USFWS	Ongoing	Yes	USFWS
Additional sampling of specific stream reaches	JKT, CC	Ongoing	Yes	EPA, DOE
Analysis of fecal coliform inputs from stormwater conveyances	Not Assigned		No	
Characterization of fecal coliform (or E.coli) bacteria, using genetic or chemical markers	Under review by CWW and MRC		No	

C CC: Clallam County
JKT: Jamestown S'Klallam Tribe
DOE: WA Dept. of Ecology
EPA: Environmental Protection Agency
CCD: Clallam Conservation District
USFWS: US Fish and Wildlife Service
HEALTH: WA Dept. of Health
MRC: Clallam Co.'s Marine Resource Committee
WDFW: WA Dept. of Fish and Wildlife
DRC: Dungeness River Audubon Center

Appendix A
Clallam County Ordinance, CCC 27.16

Available in hard copy only

Appendix B

List of Parties Currently Affected by the Shellfish Downgrade

The following is a list of users of Dungeness Bay affected by the Shellfish Closure Area.

A. Commercial shellfish harvesters:
   Shellfish Farms: Jamestown Seafood
   Northwest Corner Oyster Company
   Oyster and Clam Harvesters:
   Jamestown S'Klallam Tribe
   Lower Elwha S'Klallam Tribe
   Port Gamble S'Klallam Tribe

B. Subsistence harvesters: The three S'Klallam Tribes

C. Recreational harvesters: Local citizens and out-of area visitors

D. Tideland owners: Those who lease out tidelands for revenue:
   WA Dept. of Natural Resources (DNR)
   Clallam County
   Tideland owners/managers for recreational shellfish use:
   US Fish & Wildlife
   WA Dept. of Fish & Wildlife
   Dept. of Natural Resources
   Clallam County
   San Juan Farm Duck Club
   Dungeness Beach Association
   Dungeness Farms

   Private tideland and affected upland owners: various landowners along Marine Drive, the North Olympic Land Trust, and Dungeness Town.

E. Residents of Clallam County

F. Visitors to the Dungeness watershed, and the business that serve them.

Appendix C

Dungeness River Management Team Letter to Board of Clallam County Commissioners

Available in paper copy only

Appendix D

Other Water Quality Problem Areas
within the Sequim-Dungeness Clean Water District

Other water quality problems in the Clean Water District include, but are not limited to, the following:

- Bacterial pollution is also a problem in nearby streams/ditches that drain to the Strait of Juan de Fuca and Sequim Bay (Johnson, Bell, Cassalery, and Bagley creeks) and the extensive irrigation ditch system that connects some of these bodies of water together. These streams are on Ecology's 303(d) list, because they fail federal water quality standards. Monitoring by the Clallam Conservation District is showing that some irrigation ditches have water samples with more than 200 fecal coliform colonies/100mL of water. This exceeds federal water standards and may pose an increase public health risk (see Section IV, under *Impacts from fecal coliform* for more details about public health risk).

- Sequim Bay has several areas that are closed to shellfish harvesting for a variety of reasons. The three closed areas include: all of Washington Harbor (at the mouth of Bell Creek), the John Wayne Marina and Johnson Creek area, and a 300-yard radius around the end of the City of Sequim's wastewater treatment plant. In the sanitary survey prepared by Health, the reasons for the closures are:
    - Boat traffic in the area
    - The John Wayne Marina
    - Non-point source pollution from the Bell Creek and Washington Harbor drainages, which would include Johnson Creek

  The south portion of the Sequim Bay State Park tidelands is conditionally approved for shellfish harvesting, which means that this area may be seasonally closed by Health, due to increased boat usage and septic system pumping.

- In Agnew, documented evidence shows that wells used for drinking water are contaminated with nitrates and coliform bacteria. In July 1999, elevated levels of nitrate and total coliform bacteria were detected in several individual drinking water wells and in one public water system. Since then, Clallam County Environmental Health has investigated 32 wells and has found 13 to exceed the safe-drinking-water standards for coliform bacteria and/or nitrates, as defined by the United States Environmental Protection Agency (EPA). Clallam County obtained grant funding from Ecology to monitor the groundwater in Agnew in 2001.

- Carlsborg, adjacent to Agnew, is a rural community facing the demands of growing residential and industrial development. With no centralized sewage collection system, Carlsborg's coarse soils, overlaying an unprotected shallow drinking water aquifer, is of particular concern with regard to rising nitrate concentrations in the groundwater. Extensive monitoring conducted in the early 1990's demonstrated rising nitrate levels in the Carlsborg area. The report generated from the results of this effort, *Sequim-Dungeness Groundwater Protection Strategy* (1994) recommended that the "continued systematic monitoring of groundwater for nitrates, chlorides, hydrocarbons, and water levels on a 3-5 year basis" was necessary to monitor trends and to evaluate the success of pollution-prevention strategies. Unfortunately, there has been little monitoring of the problem. However, Clallam County

obtained grant funds in 2001 from Ecology to help implement a groundwater monitoring program.

Appendix E
Letters of Commitment

Letters included in paper copy only.

Appendix B

Public Involvement

Some handouts and focus sheets are available in paper copy only

Contact

Chris Hempleman
Southwest Regional Office
Phone: 360-407-6329 or
Email: chem461@ecy.wa.gov

Public Involvement

The Dungeness River/Matriotti Creek bacteria TMDL has been one part of a larger local response to water quality issues in fresh water and shellfish harvest restrictions in Dungeness Bay.

In 1997, DOH notified Clallam County that part of Dungeness Bay was threatened with restrictions on commercial shellfish harvest. Clallam County convened a workgroup to identify sources of contamination and coordinate a response to reduce or eliminate those sources. The workgroup included representatives of:

- Government agencies: the Jamestown S'Klallam Tribe; Clallam Conservation District, Port of Port Angeles, Puget Sound Water Quality Action Team, Washington State Department of Health, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, U.S. Fish and Wildlife Service

- Shellfish growers: Jamestown S'Klallam Tribe, NW Corner Oyster Company

- Scientific entities: Battelle Marine Lab

- Members of local watershed planning groups: Dungeness River Management Team, Marine Resources Committee

- Private citizens including tideland owners affected by the closure.

In April of 2000, when DOH restricted commercial shellfish harvesting in an area of Dungeness Bay, the workgroup became the required shellfish response team. When the County decided to take a broader approach to water quality issues and form a Clean Water District, the shellfish response team became the Clean Water workgroup.

The workgroup has been meeting approximately monthly since October 1999 to coordinate response to water quality issues. Workgroup members were involved in design of the sampling plan for the TMDL water quality study. The County and the Tribe also assisted in conducting the study.

As part of forming the Clean Water District, the County, in cooperation with the Clean Water workgroup, developed a *Clean Water Strategy*. That strategy is the foundation of the Summary Implementation Strategy for this TMDL. The Clean Water District, including the *Clean Water Strategy*, was adopted by Clallam County ordinance in June 2001.

Throughout this process the workgroup has conducted coordinated education, outreach and public involvement activities. These activities have helped to involve the community in the response to water quality issues and inform them about associated processes including the lower Dungeness bacteria TMDL.

Following are some specific activities conducted during the course of this TMDL to inform and involve stakeholders and the general public:

- One role of the Clean Water workgroup is to serve as the water quality sub-committee to the Dungeness River Management Team. A representative of the DRMT participates on the workgroup. The workgroup reports directly to the DRMT on water quality issues. In addition, Ecology has made periodic presentations to the DRMT on both the technical and process aspects of the TMDL.
- Ecology has issued two interim reports on the findings of the TMDL study: *Dungeness River and Matriotti Creek Total Maximum Daily Load Study, Preliminary Data Results for November 1999 through October 2000,* and *Preliminary Fecal Coliform Source Identification Analysis of Dungeness and Matriotti Creek Data.*
- As part of the process of forming the Clean Water District, Clallam County held a public meeting on May 2, 2001. They included technical information about non-point pollution, state water quality standards, and State Department of Health Shellfish Sanitation standards. Ecology presented findings of the TMDL study related to sources.
- Clallam County held a public hearing on May 8, 2001, on the proposed ordinance to establish a clean water district. The staff report summarizing written and oral comments received regarding the proposed ordinance is included as part of this appendix. The ordinance was adopted in June 2001. The *Clean Water Strategy* adopted as part of that ordinance is the foundation of the Summary Implementation Strategy for this TMDL.
- Clallam County, in collaboration with the Clean Water workgroup, has published two issues of *The Clean Water Herald*. This newsletter, mailed to all residents of the Clean Water District, highlights water quality issues. The winter 2001 issue included discussion of and findings from the TMDL water quality study (included as part of this appendix).
- Ecology produced informational focus sheets on the TMDL in March 2000, and May 2001, and a handout in January 2001. These materials were used as handouts to interested groups and at the public meeting in May 2001. (Copies included in this appendix.)
- Clallam County Health Department, Ecology, DOH, and the Puget Sound Water Quality Action Team jointly developed a factsheet to explain the various efforts being coordinated to address water quality issues. It was produced at the time of the initial shellfish downgrade in spring 2000, and updated in the spring of 2001 during formation of the Clean Water District. It was used as an attachment to a joint press release (DOH, the Puget Sound Water Quality Action Team, and Ecology). It was also used as a handout during presentations to interested groups such as the Board of Health, and for the public meeting on May 2, 2001. (Copy included in this appendix.)
- The Sequim Gazette and Peninsula Daily News periodically have articles that focus on the shellfish downgrade. Information on the TMDL has also been included.
- Ecology mailed copies of the draft *Dungeness River/Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study*, to approximately 40 parties and invited their

technical review and comment. We held a technical briefing on the study on March 4, 2002, to which all reviewers were invited.

- Ecology held a public comment period on the draft submittal package from April 15 through May 13, 2002. Outreach included:
  - A focus sheet mailed to approximately 4000 residents in the TMDL study area, announcing the public comment period, explaining the TMDL and water cleanup plan and inviting public comment. (Included in this appendix.)
  - Display ads in the Sequim Gazette and the Port Angeles Daily News announcing the comment period and public meeting. (Included in this appendix)
  - Information centers to provide public access to the water cleanup plan and TMDL study report, including the internet and five community locations.
  - Neighborhood workshops in two of the areas where streamside development and higher fecal coliform counts offer opportunities for improvement. At the meetings Ecology, the County, the Tribe, and the CD discussed the TMDL findings and the implementation strategy, and solicited ideas on sources and solutions. (Please see the Response to Comments, Appendix C, for a summary of comments received and notes on how those suggestions will be addressed.)
  - A public meeting/hearing on April 30, 2002 No one attending the meeting wished to provide oral comment, so a hearing was not convened..
  - A Response to Comments (see Appendix C). This will be mailed to everyone who attended the neighborhood meetings, as well as the one person who submitted a written comment.

TO: Board of Clallam County Commissioners

THRU: Bob Martin, Director
Department of Community Development

FROM: Valerie Wilson, Watershed Planner
Andy Brastad, Director
DCD Natural Resources Division

SUBJ: Staff Report - Sequim-Dungeness Clean Water District

DATE: May 2001

Background

The Washington State Department of Health issued downgrades of commercial shellfish areas in Dungeness Bay in May 2000 and May 2001. RCW 90.72 requires the County to form a shellfish protection district as defined in that statute. County staff gathered information about shellfish protection districts and discussed district formation with several watershed and marine advisory groups. In addition, a conference, "Lessons Learned," was held to hear experiences of other county governments in addressing shellfish contamination and fecal coliform issues in their watersheds. Given their watershed planning efforts (which include water quality) over the past ten years, the Dungeness River Management Team's recommendations for district formation and boundary is given high priority.

A public meeting was held May 2, 2001, to present technical information about non-point pollution, State Department of Ecology water quality standards, and State Department of Health Shellfish Sanitation standards. A public hearing was held on May 8, 2001, on the proposed ordinance to establish a clean water district (which meets the intent of a shellfish protection district under RCW 90.72).

Public Comment on the proposed Clean Water District

The following is a summary of the testimony received at the public hearing and written comments received regarding the proposed clean water district:

The table below shows the numbers of people supporting, opposing, or ambivalent to the proposed Sequim-Dungeness Clean Water District. The numbers are divided into three categories:

- verbal testimony at the Public Hearing,
- written testimony sent to the Commissioners' office and
- total number, which represents both verbal and written testimony.

The sum under the written testimony category was calculated using the number of people that signed each letter. The sum of the "Total" category was adjusted to remove double counts that came from those people who provided both verbal and written testimony.

	Verbal Testimony	Written Testimony	Total
Support	8	9	14
Oppose	13	7	17
Unclear	1	1*	2

*The written testimony of this person contradicted the verbal testimony, which was recorded in the "Oppose" category. In the "Total" category, this person was marked as "unclear" because the written testimony was provided after the verbal testimony, perhaps indicating a change in opinion.

Both verbal and written comments were combined into general categories. Major issues were identified and a summary is provided below.

More science is needed to determine the problems and sources of pollution

There was much concern about the quality of science used to identify the problem and to determine fecal coliform sources. Some people questioned the sampling protocol (which is guided by federal policy and regulations) used for sampling Dungeness Bay. Sampling at different depths of the water column and using RNA/DNA analysis to determine sources were two specific suggestions. A few people thought that the shellfish tissue should be analyzed for contamination, rather than the water.

The need for further assessment of the problem and pollution sources was used as a reason both to support and to oppose the proposed Clean Water District. Some people felt that nothing should be done until scientific assessment defines the exact sources of fecal coliform pollution. Other people saw the need for more scientific assessment as a reason to form a Clean Water District, because the District would continue to define problems and solutions.

Staff Response

Some people oppose the creation of the District, because they believe that sampling results are based on biased or poorly designed sampling methods. They are labeling this as "bad science." The sampling protocols and statistical analysis for classifying commercial shellfish beds are defined in Washington State Department of Health protocols, which adopt the National Shellfish Sanitation Standards. The sampling process is biased towards public health protection and, therefore, is conservative in its approach. WA Dept. of Health sample both waters over shellfish beds and waters in areas where pollutants are mostly likely to enter the marine waters.

The Ecology sponsored "Total Daily Maximum Load" (TMDL) study is based on intensive water quality sampling over a year. This study is very much science-based in that it adheres to the requisite Quality Control and Quality Assurance protocols, applies standard statistical analysis to sampling results and is submitted to a peer review process. This recently completed study of the lower Dungeness watershed points to nonpoint fecal colifom pollution in many areas

of the watershed. The combined coliform contributions from many different sources and locations in the watershed may ultimately end up in Dungeness Bay through roadside ditches, irrigation ditches, streams and river.

We agree that more study is required to further define the pollution sources contributing to pollution in Dungeness Bay. Additional water quality studies in Dungeness Bay and RNA analysis of fecal coliform to better determine sources is part of the Clean Water Strategy reference in the proposed ordinance (Exhibit B).

The purpose and scope of the District is too broad

There was a wide range of comments about the purpose and scope of the Clean Water District. The intent of RCW 90.72 in creating shellfish districts to fund needed water clean-up programs was mentioned by many commenters. There is fear this District will create onerous regulations and add more taxes.

Some people suggested that we keep the District focused on shellfish issues only. Some questioned why the County would extend the District to include other streams that don't influence shellfish beds or other problems, like nitrate concerns in groundwater. A few commentors recommended a watershed approach and mentioned other problems that need to be addressed by the District, like declining numbers of aquatic plants and Dungeness Crabs.

Staff Response

Some of the objectives for creating a Clean Water District are to unify our efforts in addressing water quality in the Bay and to improve water quality of the shellfish growing areas, resulting in an upgrade. The Clean Water District will not have authority to create, implement or enforce any regulations. However, the Clean Water Advisory Committee under the Clean Water District may make recommendations to those agencies that are authorized by law to take the action on the recommendation.

It is well established in the scientific literature that land use actions can impact both freshwater (ground and surface water) and marine water. Irrigation activity, on-site septic systems, fertilizer and pesticide use, animal keeping practices, pets, and storm water management all affect the quality of surface and ground water. The pollutants that result from these sources, such as pathogens, nutrients, heavy metals, oils/greases, and pesticides, have the capacity to harm humans and other biological life. It is important that the County identify and address all types of water pollution, particularly when federal or state standards are exceeded. The Clean Water District, as it is proposed, offers a holistic, collaborative approach to addressing many types of non-point pollution.

Question the boundary of the District

Several comments were made on the boundary of the District. Comments included:

- keep the boundaries to the bays (Dungeness and Sequim)
- eliminate Bagley and Siebert Creek watersheds from the District and
- keep the boundaries the same as DRMT.

There were comments about the Dungeness River Management Team (DRMT) and its involvement in the Clean Water District. Some people distrusted the intentions and recommendations of the DRMT.

Staff Response

We are proposing the same boundaries as those recommend by the Dungeness River Management Team, given their watershed planning efforts (which include water quality) over the past ten years. Their recommendation is based on a proactive watershed approach to problem-solving, common land-use activities, hydrology, and to documented ground water and surface water problems throughout the area.

Immediate action is needed to clean-up fecal coliform sources

A few people commented on the need for action over more study and planning. They want the County to start working with landowners to fix problems that have already been identified.

Staff Response

Identified problems have been, are being, and will continue to be address as staffing and resources allow.

Summary

Staff recommends the ordinance as drafted as the responsible course of action in view of the documented decline in water quality. The collaborative and watershed approach will lend itself to coordinating efforts to further define water quality problems and recommend solutions to documented problems.

The attached documents contain water quality data from WA Dept. of Health and WA Dept. of Ecology.

c. correspondence file
project file

Appendix C

Response to Comments

Response to Comments

Ecology conducted a comment period on the *draft Water Cleanup Plan for Bacteria in the Lower Dungeness Watershed* from April 15 through May 13, 2002.

Only one formal comment was submitted during the comment period:

> Received April 12, 2002
>
> To whom it may concern –
>
> I'm sure you people are aware of the large population of harbor seals that are in Dungeness Bay. They contribute a great deal to the fecal contamination that is present in the water.
>
> If these predators were thinned out it would help a lot to clean the water up. Also it would help our fishing.
>
> Thank you –
> Cliff Vining
>
> *Response:* We are considering the bacterial waste contributed by warm-blooded wildlife, which includes seals in Dungeness Bay. There is an ongoing study of Dungeness Bay, assessing the contribution of the river and other freshwater sources as a conveyance for bacteria waste to the Bay. In the same study we are tracking the circulation of the water and taking water samples where there may be seal or other wildlife inputs of bacteria waste.
>
> However, the current TMDL/water clean-up plan addresses bacterial pollution in the Dungeness River and freshwater streams and the Dungeness River. Bacterial contamination was found in several freshwater bodies of water. For example, Matriotti Creek failed to meet bacterial standards south of Hwy 101. It is very unlikely that seals have any impact in these freshwater areas.

As part of the outreach for the comment period, Ecology, the County, the Tribe, and the CD hosted two neighborhood meetings on April 27, one for Matriotti and Mudd Creeks, and one for Golden Sands and Meadowbrook Creek. These two areas were selected due to streamside development and bacteria counts that offered the most opportunity for improvement.

Ecology mailed notice of the meetings to over 350 residences. Approximately 25 citizens attended the two meetings. Following are attendees' ideas for water cleanup activities, as well as responses describing how the ideas will be addressed:

1. **Focus. Look at top 7 areas. For septics, concentrate on those of concern in trouble areas.**

   Response: Using the preliminary results from Ecology's TMDL study and parcel information on Clallam County's base map, all parcels adjacent to water quality problem streams were identified. The problem areas examined in this survey include Matriotti Creek and its tributaries, Meadowbrook Creek and Slough and the Golden Sands area. The lower Dungeness mainstem river (downstream of Schoolhouse Bridge) is also a problem area, identified in the TMDL. A grant has been requested by Clallam County for land acquisition from willing landowners in the Rivers End road area.

   Using the Clallam County Assessor Database and the Department of Community Development (DCD) Permit Plan database and central files, septic permits and other information were reviewed for those identified parcels. Factors that identified a **"Septic of Concern"** include:

   5) Age: 10 yrs or older
   6) Repairs made to on site system, with a lack of receipts to indicate repairs were made.
   7) No septic permit on file or no septic information available
   8) No recent sanitary survey completed or sanitary survey indicates:
      a) Lack of pumping history
      b) Repairs needed
      c) No recovery time
      d) System difficult to evaluate due to overgrowth

   Each problem area's parcel research was compiled and is stored in one of four binders. The binders are kept with the Environmental Health Division for review and update. In addition, an Access database was developed for tracking remediation activity electronically.

   The three water quality problem areas (used in the survey) were prioritized based on their contribution to bacterial waste loading to Dungeness Bay. The results of the survey and the ranking of priority areas are outlined below.

   b. Matriotti Creek (including Mud Creek Tributary)
      - Highest priority area based on fecal coliform loading
      - 154 parcels were identified as adjacent to surface water
      - 59 parcels were identified as having a septic of concern

   d. Meadowbrook Creek and Slough
      - Second priority area
      - 60 parcels were identified as adjacent to surface water
      - 29 parcels were identified as having a septic of concern

   e. Golden Sands Area
      - Third priority area
      - 124 parcels were identified as adjacent to surface water
      - 36 parcels were identified as having a septic of concern

2. **Analyze more recent data: are the "fixes" reducing bacteria?**

   Response: Ditch, stream and river water are being sampled by the Jamestown S'Klallam Tribe, Clallam Conservation District and Clallam County. Staff from the Jamestown Tribe monitor several TMDL sampling stations on Matriotti Creek, Meadowbrook Creek and the Dungeness River once a month for fecal coliform, temperature and flow. StreamKeepers of Clallam County sample irrigation ditches throughout the Sequim-Dungeness watershed once a month. The Jamestown Tribe and Clallam County will be analyzing and summarizing this data for the next Neighborhood meetings, to be scheduled.

3. **Add more monitoring to help landowners know if their property is a contributor.**

   Response: The Jamestown Tribe has agreed to work with landowners within designated water quality problem areas, who would like additional monitoring.

4. **Septic plan – don't have one guy doing everything. Too much collusion. Need checks and balances.**

   Response: There are a variety of people who design, install and inspect septic systems in Clallam County. Further, the Septic Survey, which identified "septics of concern" was conducted by Clallam County staff. All landowners, not just those with an identified "septic of concern" can choose to have an inspection of their septic systems from a list of County approved septic designers. In the cases of complaints and obvious failures, an Environmental Health Specialist from Clallam County's Environmental Health Division will inspect septic systems.

5. **More tests/results before next neighborhood meetings. Report results.**

   Response: See the response to comment #2 above.

6. **Check peoples' septics**

   Response: See the response to comment #1

7. **Open up Golden Sands Slough – it's stagnant because debris is clogging the road culvert.**

   Response: The Clallam County Public Works Department will remove debris from culverts under County roads, particularly when there is danger of water flooding over the roadway. In cases of debris blocking road culverts, County residents can call 417-2319 to report these occurrences.

8. **Buyout at Golden Sands?**

Response: There are two priorities for Clallam County's land acquisition program, to benefit salmon recovery and to remove residences from floodways to prevent human injury. Since the Golden Sands does not have salmon habitat or risk of human injury from flooding events, it is unlikely that Clallam County will pursue grant funds for land acquisition in the Golden Sands area.

9. Get information out about CREP (Conservation Reserve Enhancement Program) and other Conservation District programs. Direct mailing.

Response: CREP is a rather complicated program that must be tailored to individual situations. In the past we have done direct mailings targeting landowners along Matriotti Creek and have not had a good response. In fact, we have mailed information to many people who requested it without a response. Our total budget for CREP marketing, plan preparation, contract preparation, and administration for the past three years has been about $15,000/year, so we are limited in what we can do and try to do what is most effective and efficient. All Conservation District programs are publicized in our quarterly newsletter. We would love to add people to our mailing list for our newsletter. Give us a call, send us an email or a note and we will add you to our list. We try to get the newspapers to help spread the word about our programs, too. We would appreciate any other suggestions that might help us get the word out about assistance that is available to landowners.

10. Check 3 Crabs' septic system

Response: According to Clallam County records, the onsite system for the 3 Crabs was last checked on June 15, 2001 and it was fully functioning. Generally, their onsite system is checked yearly.

11. Must offer economic alternatives in problem areas

Response: For county landowners, the Clallam Conservation District has a Cost-Share Program that covers up to 75% of the costs associated with implementing Best Management Practices that protect water quality.

In order to maintain the highest possible property value, a fully functioning septic system is necessary, particularly when selling a house. Further, through a partnership between Clallam County and the Jamestown S'Klallam Tribe, limited funds will be available for cost-sharing for parcels identified with a Septic of Concern. Clallam County will encourage voluntary inspection/maintenance of their septic systems by providing limited cost-sharing to inspect their system and install risers for easy future access. Cost sharing financial assistance will be available for parcels with identified septics of concern located in Matriotti Creek and its tributaries, Meadowbrook, and Golden Sands areas. Each parcel will be reimbursed up to $250 for the following:

- Excavation of tank & installation of inspection risers

- Inspection of septic system (System must be inspected by a professional licensed Designer)

If a Septic of Concern has had an inspection within the past year, and has already installed risers, then landowners may be reimbursed up to $250 for the following:

- Tank pumping (System must be pumped by a licensed professional pumper)
- System repairs (must be designed and installed by licensed professionals, unless repair is of minor nature)
- Designer/Installer fees (Must be licensed professionals)

12. Community septic for Golden Sands. Grants?

Response: Clallam County Natural Resources Division Staff are currently researching options for design and financing of a community onsite system in the Golden Sands area.

13. More monitoring in Golden Sands.

Response: The Jamestown Tribe has agreed to work with landowners within designated water quality problem areas, who would like additional monitoring.

14. Mushroom project in Meadowbrook area?

Response: Innovative remediation technologies, like mycoremediation (using mushrooms to "eat" bacteria), may be applied in areas to mitigate wildlife waste inputs to bacterial pollution. Additional funding will be needed and a suitable location needs to be identified before applying this type of technology. the Conservation District has plans to work with Battelle on a mycoremediation pilot project at the Game Farm.

Ecology also held a public meeting/hearing of April 30th; approximately 30 citizens attended. Ecology presented the findings of the TMDL study, and the County, with assistance from other local partners, presented the updated implementation plan. Although an opportunity to give oral testimony was offered, no one was interested in making a comment so a hearing was not convened.

Appendix D

Quality Assurance Project Plan for Dungeness River/Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load

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Appendix E

Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study

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by
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Also available on http://www.ecy.wa.gov/biblio/0203014.html or
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