

California Regional Water Quality Control Board
North Coast Region

Laguna de Santa Rosa TMDL

2009 Source Analysis Monitoring Report

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Contents

1.0 INTRODUCTION

2.0 MONITORING QUESTIONS AND STATISTICAL APPROACHES

3.0 SAMPLING LOCATIONS & PROTOCOLS

4.0 RESULTS

5.0 CITATIONS

Tables

Table 1. Land Use Areas in the Laguna Watershed

Table 2. Analysis Constituents

Table 3: Summary of Replicate Sample Results

Table 4. Probability of a Difference between Land Use Category Runoff Concentrations

Table 5. Probability of a Difference between Wet and Dry Weather Period Runoff Concentrations by Land Use Category

Figures

Figure 1: Box Plots showing Total Phosphorus Concentrations by Weather Period

Figure 2: Box Plots showing Dissolved Phosphorus Concentrations by Weather Period

Figure 3: Box Plots showing Total Nitrogen Concentrations by Weather Period

Figure 4: Box Plots showing Ammonia-N Concentrations by Weather Period

Figure 5: Box Plots showing Nitrate+Nitrite-N Concentrations by Weather Period

Figure 6: Box Plots showing Total Suspended Solids Concentrations by Weather Period

Figure 7: Box Plots showing Total Organic Carbon Concentrations by Weather Period

Figure 8: Box Plots showing Total Phosphorus Concentrations by Land Use

Figure 9: Box Plots showing Dissolved Phosphorus Concentrations by Land Use

Figure 10: Box Plots showing Total Nitrogen Concentrations by Land Use

Figure 11: Box Plots showing Ammonia-N Concentrations by Land Use

Figure 12: Box Plots showing Nitrate+Nitrite-N Concentrations by Land Use

Figure 13: Box Plots showing Total Suspended Solids Concentrations by Land Use

Figure 14: Box Plots showing Total Organic Carbon Concentrations by Land Use

Figure 15: Probability Plots comparing the Distribution of Total Phosphorus Concentrations to Normality.

Figure 16: Probability Plots comparing the Distribution of Dissolved Phosphorus Concentrations to Normality

Figure 17: Probability Plots comparing the Distribution of Total Nitrogen Concentrations to Normality

Figure 18: Probability Plots comparing the Distribution of Ammonia-N Concentrations to Normality

Figure 19: Probability Plots comparing the Distribution of Nitrate+Nitrite-N Concentrations to Normality
Figure 20: Probability Plots comparing the Distribution of Total Suspended Solids Concentrations to Normality
Figure 21: Probability Plots comparing the Distribution of Total Organic Carbon Concentrations to Normality
Figure 20: Hierarchical Clustering of Sampling Locations collected from Cropland and Pasture Land Use Areas
Figure 21: Hierarchical Clustering of Sampling Locations collected from Orchards, Groves, Vineyards and Horticultural Land Use Areas
Figure 22: Hierarchical Clustering of sampling Location collected from Sewered Residential Land Use Areas
Figure 23: Hierarchical Clustering of sampling Location collected from Septic System Residential Land Use Areas
Figure 24: Hierarchical Clustering of sampling Location collected from Commercial and Services Land Use Areas
Figure 25: Hierarchical Clustering of sampling Location collected from Range Land Use Areas
Figure 26: Hierarchical Clustering of sampling Location collected from Forested Land Use Areas

Appendices

Appendix A. Sampling Locations
Appendix B: Water Sample Results
Appendix C: Water Sample Result Sample Sizes
Appendix D: Blank Sample Results
Appendix E: Replicate Sample Results
Appendix F. Constituent Concentrations collected in 2008
Appendix G1. Descriptive Statistics for All Samples
Appendix G2. Descriptive Statistics for Cropland and Pasture Land Use Samples
Appendix G3. Descriptive Statistics for Orchards, Groves, Vineyards and Horticultural Land Use Samples
Appendix G4. Descriptive Statistics for Sewered Residential Land Use Samples
Appendix G5. Descriptive Statistics for Septic System Residential Land Use Samples
Appendix G6. Descriptive Statistics for Commercial and Services Land Use Samples
Appendix G7. Descriptive Statistics for Range Land Use Samples
Appendix G8. Descriptive Statistics for Forested Land Use Samples
Appendix G9. Descriptive Statistics for Cropland and Pasture Land Use Samples without data from the outlier sampling location CROP2
Appendix G10. Descriptive Statistics for Orchards, Groves, Vineyards and Horticultural Land Use Samples without data from the outlier sampling location ORCH2

Appendix G11. Descriptive Statistics for Range Land Use Samples without data from the outlier sampling location RANG2

Appendix H. Sites with significant difference from the remaining set of data collected for the same land use category and weather period.

1.0 INTRODUCTION

The Laguna de Santa Rosa (Laguna) watershed was added to the 2002 California Section 303(d) list of impaired waterbodies for excessive nutrients (nitrogen and phosphorus), low dissolved oxygen (DO), and high temperature. Staff of the North Coast Regional Water Quality Control Board's (Regional Water Board) Total Maximum Daily Load (TMDL) Development Unit are scheduled to complete the technical analyses for the Laguna TMDLs by 2011.

This Report documents the water quality data collected during 2008 in support of the Laguna TMDL. Companion documents include the Monitoring Plan (NCRWQCB, 2008a) and Quality Assurance Project Plan (NCRWQCB, 2008b). The water quality data collected are presented below based on the identified Tasks in the Monitoring Plan. The focus of this monitoring is to assess the distributional qualities (e.g., median, percentiles) of pollutant concentrations in runoff from different land uses.

The Laguna is currently being studied to develop the TMDL staff report. California TMDL guidance (CSWRCB, 2005) identifies specific elements that must be included in the TMDL staff report. One of these essential elements is a *Source Analysis*. The goal of the *Source Analysis* is "To provide a complete inventory and description of all sources of the pollutant of concern, including point, nonpoint, and background sources in the watershed."

The TMDL *Source Analysis* should answer the following questions:

- What are the pollutant sources of concern in the watershed?
- What are the characteristics of the sources (e.g., timing, location, loading)?
- What is the relative magnitude or importance of each source?
- How are sources grouped for analysis in the TMDL (e.g, land use, subwatershed)?
- What are the permit limits and effluent characteristics of the point sources?

Non-point sources contribute a large portion of the pollutant loading to the Laguna (LSRF, 2007). Loading from non-point sources are generally more difficult to quantify than point sources. Discharges from point sources are easier to estimate due to the data collected through monitoring required under the NPDES permit. A two-phase approach is being conducted to collect adequate information for the TMDL *Source Analysis*. The first phase was to assess spatial patterns by quantifying loads from tributary watersheds (NCRWQCB, 2008). The second phase is to assess loading from major land uses in the watershed. The data presented in this report was collected to address step two.

Pollutants of concern in the Laguna relate to the constituents on the Section 303(d) List. Sources of nutrients, suspended solids, and oxygen demanding substances need to be identified and quantified. The period of critical condition occurs during late summer when eutrophic conditions have the greatest impact to beneficial uses. As such, low flow loadings during the summer may have a greater impact on uses than storm event loads during winter high flow periods. The quantity of storm event loads of sediment that are retained within the Laguna was estimated by PWA(2004). PWA (2004) estimated the current sediment yield in the Laguna watershed is approximately 153 ac-ft/yr. About 50 percent of this sediment yield is stored in the watershed (mostly as coarse sediment in the headwaters or fine sediment in lower flood control channels), 25 percent settles out in the Laguna and 25 percent is delivered to the Russian River. Therefore, storm event loads are not largely retained within the Laguna to cause impairment of uses during late summer.

2.0 MONITORING QUESTIONS AND STATISTICAL APPROACHES

The Regional Water Board developed the Monitoring Plan and QAPP to address the following set of management questions for the Laguna TMDL:

1. What are the distributional qualities of base flow pollutant concentrations for the major land uses in the Laguna watershed?
2. What are the distributional qualities of storm event runoff pollutant concentrations for the major land uses in the Laguna watershed?
3. How do pollutant base flow and storm event runoff concentrations compare to the land use runoff estimates used in the original TMDL?
4. How do pollutant base flow and storm event runoff concentrations compare to published land use runoff estimates?

A sample survey approach is the most appropriate sampling design to address these types of monitoring questions. This type of question requires answers that apply to all of the resource of interest that occur in a geographic area. There are two approaches to obtaining information on the aquatic environment.

Historically, the most common approach was to collect information at locations that were chosen based on a variety of judgmental factors and the samples are “assumed” to represent the entire resource. Judgmentally selected samples are prone to introduced bias from potential unknown factors. The second approach, the sample survey design, relies upon statistical methodology to provide quantitative information about the aquatic resource with a known level of uncertainty.

The data collected has been assessed with a number of statistical methods to help answer the monitoring questions.

Non-parametric statistical methods are used for all assessments. Nonparametric methods are often referred to as *distribution free* methods as they do not rely on assumptions that the data are drawn from a given probability distribution. Commonly used statistics like mean and standard deviation assume the data set follows a Gaussian (i.e., normal) distribution. Water quality data rarely meet that assumption. Non-parametric methods are more robust due to the reliance on fewer assumptions.

When parametric tests are applied to non-normal data, their power to detect differences which are truly present is much lower than that for the equivalent nonparametric test (Helsel and Hirsch, 2002). Thus, parametric hypothesis tests are not capable of discerning the difference between the two groups of data. The skewness and outliers in the data inflate the sample standard deviation used in the hypothesis test (i.e., t-test). The parametric method assumes it is operating on a normal distribution having this standard deviation, rather than on non-normal data with smaller overall spread. The test then fails to detect the differences present.

The *Mann-Whitney test* is a non-parametric test for assessing whether two samples of observations come from the same distribution. The method is also known as the Wilcoxon Rank-Sum test. This statistical test is a nonparametric (i.e., distribution-free) inferential statistical method. The test null hypothesis is that the two samples are drawn from a single population. The test is similar to performing an ordinary parametric two-sample *t* test, but is based on ranking the data set. The *Kruskal-Wallis Test* is a one-way analysis of variance conducted using ranked data. The non-parametric method is used for testing equality of population medians among groups. The test is an extension of the *Mann-Whitney Test* applied to 3 or more groups.

3.0 SAMPLING LOCATIONS & PROTOCOLS

The objective is to estimate the magnitude and variability of pollutant loading from major land uses in the Laguna watershed. The sample survey design requires that both the "target population" for which information is wanted and the "elements" that make up the target population must be specifically defined.

USGS (2006) land use spatial data was used to determine land use distributions within the Laguna watershed and sub-watersheds. Land use categories are typically defined by "Anderson" Levels (Anderson et al. 1976). Level I category land uses are major land uses including Urban, Agriculture, Rangeland, Forest Lands, or Barren. Level II defines land use subtypes such as residential and commercial. The Level I and Level II land use areas and percentages were extracted from GIS layers for the entire Laguna watershed (Table 1).

Table 1. Land Use Areas in the Laguna Watershed

Land Use Types (Levels I & II)	Acres	Percent
Agriculture	56,977	35.4%
Cropland and Pasture	44,002	27.3%
Orchards, Groves, Vineyards, Nurseries, & Horticulture	11,977	7.4%
Other Agricultural Land	605	0.4%
Confined Feeding Operations	393	0.2%
Urban	33,622	20.9%
Residential	25,030	15.5%
Commercial and Services	4,938	3.1%
Other Urban or Built-up Land	1,369	0.9%
Transportation, Communications, & Utilities	1,151	0.7%
Mixed- Urban or Built-up Land	584	0.4%
Industrial	550	0.3%
Rangeland	21,969	13.6%
Shrub and Brush Rangeland	11,320	7.0%
Mixed Rangeland	6,344	3.9%
Herbaceous Rangeland	4,305	2.7%
Forest	48,025	29.8%
Evergreen Forest Land	48,025	29.8%
Barren	209	0.1%
Transitional Areas	133	0.1%
Strip Mines	76	0.0%

Target Population

The target population is the major land use categories in the Laguna watershed. The subpopulations are the specific land uses selected to represent the majority of the watershed. Based on the land use type acreage within the watershed, the following seven land use categories were chosen for the TMDL *Source Analysis*. Rangelands were combined for the Level I category. Residential areas were divided between sewerred and non-sewerred land parcels. These land use types represent 97% of the Laguna watershed area.

Selected Land Use Categories:

1. Cropland and Pasture
2. Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas
3. Residential – sewerred
4. Residential – non-sewerred
5. Commercial and Services
6. Rangeland
7. Forest Land

Sample Frame

Several factors must be evaluated to find sample locations representing the specific land use categories. First, a majority of the upstream drainage must represent one of the selected land use categories. Second, sampling locations must be accessible. Spatial data was used to delineate drainage areas in relation to land use. The 10-meter USGS Digital Elevation Model was used to delineate the Laguna watershed into 192 subbasins. Those subbasins with greater than 50% of a selected land use were identified as the sample frame. Fifty (50) sampling locations representing all of the selected use categories were identified as the sample frame. The sampling locations are described in Appendix A.

Using this approach, sample locations could not be found for two of the land use categories: commercial and sewerred residential drainages. For these land use categories, a spatial data showing storm drain and outlet locations was used to identify smaller drainage areas with a majority of the upstream drainage covered by those two land use categories.

Sample Site Selection

In order for this variability to be representative of the land uses, sampling locations must be selected on a random basis so as not to bias the results. However, simple random selection introduces an additional logistical challenge. Sites randomized must be sampled in that particular order. Simple random selection using all sites in a subpopulation the entire Laguna water would likely result in subsequent locations separated by large distances.

Stratified random selection allows the grouping of sample locations within pre-defined sets of sites (i.e., land use strata). Eighteen (18) samples for each land use during both dry and wet weather periods were collected. Land use categories with fewer representative sites than 18 were sampled multiple times over different time periods providing distributional information containing both spatial and temporal variability of the subpopulation.

Sampling logistics followed the USEPA design approach (Stoddard et al. 2005). Small sets of random samples, termed “partitions” were randomly sorted without replacement and each sampling location within each partition was visited to allow for proper calculation of weighting factors needed in estimating population metrics. If there was inadequate water for sampling at a particular site, it was noted and the next site in the stratum was visited for sampling. The process was continued until all samples for each subpopulation (i.e., land use) had been collected. Appendix A lists the sampling locations.

Sampling Protocols

The source assessment included samples collected during both wet and dry periods. Identification of wet and dry periods followed USEPA guidance (EPA 833-B-92-001) and federal regulations (40 CFR 122.21(g)(7)(ii)). Wet period samples were collected within 72-hours of 0.1-inch of precipitation as measured at the City of Santa Rosa Municipal Services Center Weather Station (<http://ci.santa-rosa.ca.us/departments/publicworks/stormwatercreeks/weather/>). Dry period samples were collected at least 72-hours following a precipitation event.

The concentrations of surface water draining from these land use types were sampled to assess loading variability across the source category. Field triplicates were collected at one site for each land use category during both wet and dry periods to assess sampling variability. Blanks samples were collected for all constituents on each date of sampling. The same set of constituents were analyzed as measured in the sub-watershed assessment (CRWQCB, 2008). In addition, the total suspended solids sample was partitioned into coarse and Fine fractions (Table 2)

Table 2. Analysis Constituents

Constituent	Minimum Detection Limit (mg/L)
Total Phosphorus	0.010
Dissolved Phosphorus	0.010
Total Nitrogen	0.025
Ammonia-N	0.008
Nitrate + Nitrite-N	0.010
Total Suspended Solids	0.015
Coarse Suspended Solids (>63µm)	0.015
Fine Suspended Solids (<63µm)	0.015
Total Organic Carbon	0.029

Data Quality Assessment

The data collected were reviewed according to the Quality Assurance Project Plan. Data were examined for compliance with the stated Data Quality Objectives (DQOs). If DQOs were not met, data were not presented nor used in the TMDL *Source Analysis*. The data presented in this report comply with the DQOs and are of sufficient quality for use in the TMDL *Source Analysis*.

4.0 RESULTS

The measured concentrations of collected water samples are presented in Appendix B. The number of samples analyzed and the number with results below detection limit are shown in Appendix C. A total of 2,167 samples were analyzed with 5% of these samples measured below the minimum detection limit (MDL). The largest numbers of results below the MDL were found for suspended solids samples collected in sewer residential areas.

Blank sample results are presented in Appendix D. Several blank samples show detectable concentrations for ammonia-N and total organic carbon. These results suggest that the blank water used may have been suspect for these constituents. The Regional Board used blank water purchased as “distilled” from local grocery stores in gallon plastic bottles. The distillation and storage process appears to introduce ammonia and organic carbon contaminants to the blank water. Without a reliable source of blank water, one cannot assess the possibility of introduced contaminants during sampling. It is *strongly* recommended that another source of blank water be located by the Regional Board for future monitoring projects.

Replicate sample results are shown in Appendix E: The 90% confidence level for each replicate is calculated with the median confidence level presented in Table 3. The confidence level was calculated using the measured concentrations from the instrument calibration curve not censored by the detection limits. Confidence Limits are similar in magnitude to the MDL.

Table 3: Summary of Replicate Sample Results

Constituent	Median 90% Confidence Level (mg/L)	Method Detection Limit (mg/L)
Total Phosphorus	0.004	0.010
Dissolved Phosphorus	0.006	0.010
Total Nitrogen	0.030	0.025
Ammonia	0.011	0.008
Nitrate + Nitrite	0.011	0.010
Total Suspended Solids	2	1.5
Total Organic Carbon	0.162	0.029

The Regional Board also collected samples for analysis at six of sampling locations during the summer of 2008. These samples were analyzed for most of the same constituents as shown in Appendix F. The sampling was conducted for the first phase of the TMDL *Source Analysis* discussed in the introduction above (NCRWQCB, 2008). The data collected in 2008 was combined with data collected at the same location in 2009 for subsequent data assessment.

Descriptive Statistics

Descriptive statistics describing the distributional qualities of the combined data are presented in Appendices G1 – G8. Box plots showing the constituent distributions appear in Figures 1 - 14. Results reported as measured below the minimum detection limit were assessed using one-half the minimum detection limit to calculate statistics and conduct hypothesis tests (Helsel and Hirsch, 2002).

Cropland and pasture areas exported the greatest concentrations of total and dissolved phosphorus. Total nitrogen concentrations showed no general pattern except that wet samples were higher than dry samples. High levels of ammonia-N and total organic carbon were observed in runoff from residential areas on septic system during wet weather. Residential areas that are sewered showed the highest concentrations of nitrate-N during both dry and wet weather periods. Suspended solids concentrations were highest during wet weather from rangelands, orchards and vineyards, and residential areas with septic system, with fine sediment predominating.

The distributional characteristics of the constituent concentration data was evaluated to determine the appropriate hypothesis test to apply for data comparison. Commonly used parametric statistical tests are not valid for distributions that are not normal (i.e., Gaussian). Similar non-parametric tests can be used to assess non-normal data distributions.

Figures 15-21 show the distribution of the constituent concentration data compared to a normal distribution of random data. Plotting the standard normal deviate of the data produces a straight line for data that are normally distributed. Deviation from a straight line represents departure from normality. None of the constituent concentration data match the normally distributed data. Therefore, the constituent concentration data are not normally distributed and nonparametric statistical approaches should be applied to these data.

The representativeness of data from individual sampling location for the respective land use was evaluated using the Mann-Whitney Test. The set of concentration data collected at a particular station was compared to the remaining set of data collected for that same land use category and weather period. The hypotheses are:

$$H_0: \eta_1 = \eta_2 \text{ versus } H_a: \eta_1 \neq \eta_2, \text{ where } \eta \text{ is the population median.}$$

Those tests that resulting in a significant difference ($\alpha = 0.05$) from the Mann-Whitney Test for equality of two population medians are shown in Appendix H. Results show that several sampling locations show differences between the constituent concentrations (i.e., reject H_0 and accept H_a at $\alpha = 0.05$). In particular, numerous differences in both wet and dry periods were observed at locations CROP2, ORCH2, and RANG2. This large variation of runoff concentration

between these similar land use areas is likely due to the limited number of locations in the sampling frame for these particular land uses. There is a logistical issue of identifying enough sampling locations with public access that drain areas with a predominance of a specific land use. Additional sampling locations may have resulted in identifying a more accurate median for these particular land uses.

Cluster analysis was conducted to more fully assess the constituent concentration differences between the sampling locations for each land use category. Cluster analysis is a multivariate procedure for detecting natural grouping in data. The results from hierarchical clustering can be represented graphically as a tree with adjacent locations shown with the most similarity.

For each land use category, constituent concentrations from each sampling location were clustered using the median linkage method with Euclidean distance (SPSS, 1996). The clustering analysis results support the results of the Mann-Whitney Test for equality of two population medians (Figures 19 – 26). The same three locations show the largest distance from the remaining locations for that land use: CROP2, ORCH2, and RANG2.

These two lines of evidence suggest that these three locations may not be representative of the land use category. However, there may not be justification for the removal of samples collected at these locations from the data set for that land use category. The sample frame for each of the land use categories with these outlier locations was very limited due to sampling logistical issues. There were simply a limited number of locations identified that could meet the sampling design requirements due to issues with public access and mixed land uses.

The land use categories with a larger number of locations in the sample frame (i.e., forests) did not reveal any particular location as a possible outlier. In contrast, only three sampling locations were identified for the sampling frame of the Rangeland land use category. The determination that one location was significantly different than the other two locations may simply be a result of the limited size of the sampling frame. The variability range within these land use categories may actually be as large as was measured with a limited sampling frame.

The representativeness of a particular sampling location for the identified land use category may be an issue depending on the use of the data. The purpose of this monitoring effort was to collect information for the TMDL *Source Analysis*. The TMDL *Source Analysis* will review these data with consideration of other estimates of land use constituent loading. Descriptive statistics describing the distributional qualities of the data after removing the apparent outlier sampling location data are presented in Appendices G9 – G12. Results reported as measured below the minimum detection limit were assessed using one-half the minimum detection limit to calculate statistics and conduct hypothesis tests (Helsel and Hirsch, 2002).

Compare Subpopulations

The Monitoring Plan was designed collect samples from the selected land use area during both wet and dry weather periods. The constituent concentration data was tested for differences between land use categories using the Kruskal-Wallis Test. The non-parametric method is used for testing equality of population medians among groups. The test is an extension of the *Mann-Whitney Test* applied to 3 or more groups. The hypotheses are:

$H_0: \eta_1 = \eta_2 \dots = \eta_n$ versus $H_1: \eta_1 \neq \eta_2 \dots \neq \eta_n$, where η is the population median.

Hypothesis test results showed a significant difference (i.e., reject H_0 and accept H_a at $\alpha = 0.05$) between land uses for all weather, wet period and dry period concentrations for all of the constituents measured (Table 4; Figures 1 - 8). The result supports the monitoring objective to assess if a difference exists between runoff concentrations in wet versus dry weather periods, and to quantify that difference.

Table 4. Probability of a Difference between Land Use Category Runoff Concentrations

Constituent	Probability*		
	All	Wet	Dry
Total Phosphorus	<0.001	<0.001	<0.001
Dissolved Phosphorus	<0.001	<0.001	<0.001
Total Nitrogen	<0.001	<0.001	<0.001
Ammonia-N	<0.001	<0.001	<0.001
Nitrate + Nitrite-N	<0.001	<0.001	<0.001
Total Suspended Solids	<0.001	<0.001	<0.001
Total Organic Carbon	<0.001	<0.001	<0.001

* **Bold** text denotes a significant difference at $\alpha = 0.05$

The constituent concentration data was compared between wet samples and dry samples for each land use using the Mann-Whitney Test. The hypotheses are:

$H_0: \eta_1 = \eta_2$ versus $H_1: \eta_1 \neq \eta_2$, where η is the population median.

Hypothesis test results showed a significant difference (i.e., reject H_0 and accept H_a at $\alpha = 0.05$) between wet period and dry period concentrations for several of the land uses (Table 5; Figures 8 - 15). The results generally support the monitoring objective to assess (and quantify) if a difference exists between runoff concentrations for the different land uses in wet versus dry weather periods, and to quantify that difference.

Table 5. Probability of a Difference between Wet and Dry Weather Period Runoff Concentrations by Land Use Category

Constituent	Probability*							
	All	COM	CROP	FOR	ORCH	RANG	SEPT	SEWR
Total Phosphorus	0.057	0.343	0.387	0.541	0.816	0.005	0.001	0.331
Dissolved Phosphorus	0.076	0.137	0.938	0.478	0.230	0.044	0.005	0.036
Total Nitrogen	<0.001	0.613	<0.001	0.353	0.006	0.249	<0.001	0.927
Ammonia-N	0.068	0.029	0.358	0.293	0.042	0.001	<0.001	0.564
Nitrate + Nitrite-N	0.009	0.950	0.004	0.574	0.028	0.947	<0.001	0.248
Total Suspended Solids	<0.001	0.496	0.064	0.072	<0.001	0.014	0.017	0.177
Total Organic Carbon	<0.001	0.825	0.008	<0.001	0.205	<0.001	<0.001	<0.001

* **Bold** text denotes a significant difference at $\alpha = 0.05$

5.0 CITATIONS

Anderson, J.R., Hardy, E.E., Roach J.T., and Witmer R.E. 1976. A land use and land cover classification system for use with remote sensor data: U.S. Geological Survey Professional Paper 964, <http://pubs.er.usgs.gov/pubs/pp/pp964/>

Helsel, D.R. and R. M. Hirsch, 2002. Statistical Methods in Water Resources Techniques of Water Resources Investigations, Book 4, Chapter A3. U.S. Geological Survey, Reston VA.

NCRWQCB, 2008. Laguna de Santa Rosa TMDL Monitoring Report – 2008. North Coast Regional Water Quality Control Boars, Santa Rosa, CA.

PWA, 2004. Sediment sources, rate and fate in the Laguna de Santa Rosa, Volume II. prepared for U.S. Army Corps of Engineers, San Francisco District, Project Number 1411-08. Philip Williams and Associates, Ltd.

SPSS, 1996. SYSTAT 6.0 User Manual. SPSS Inc., Chicago, IL.

Stoddard, J. L., D. V. Peck, S. G. Paulsen, J. Van Sickle, C. P. Hawkins, A. T. Herlihy, R. M. Hughes, P. R. Kaufmann, D. P. Larsen, G. Lomnický, A. R. Olsen, S. A. Peterson, P. L. Ringold, and T. R. Whittier. 2005. *An Ecological Assessment of Western Streams and Rivers*. EPA 620/R-05/005, U.S. Environmental Protection Agency, Washington, DC.

USGS, 2006. Enhanced Historical Land-Use and Land-Cover Data Sets of the U.S. Geological Survey. Data Series 240. U.S. Geological Survey. <http://pubs.usgs.gov/ds/2006/240/>.

Appendix

Appendix A. Sampling Locations

Site ID	Thomas Bros. Map Location	Road Crossing	Latitude	Longitude
COM1	384 B3	Marlow	38.457	-122.752
COM2	384 E6	Pierson	38.437	-122.725
COM3	384 J6	Farmers	38.441	-122.687
COM4	384 G6	Brookwood	38.439	-122.702
COM5	384 F6	Mendocino	38.437	-122.714
COM6	384 C3	Coffey on Railroad Bridge	38.463	-122.742
COM10	384 F6	Mendocino	38.437	-122.714
CROP1	424 D6	Derby	38.336	-122.733
CROP2	424 C6	Stony Point	38.336	-122.741
CROP3	383 F4	Guerneville	38.453	-122.794
CROP4	383 C7	Sanford	38.430	-122.825
CROP5	363 D2	Windsor	38.518	-122.821
CROP6	424 J4	Snyder	38.351	-122.686
FOR1	343 J5	Leslie	38.546	-122.772
FOR2	365 F3	St Helena	38.512	-122.638
FOR3	343 J5	Chalk Hill	38.547	-122.773
FOR4	344 E5	Leslie	38.550	-122.723
FOR5	385 H5	Meadowridge	38.446	-122.610
FOR6	365 D4	Calistoga	38.506	-122.650
FOR7	365 D1	Calistoga	38.520	-122.658
FOR8	344 J4	Porter Creek	38.557	-122.694
FOR9	385 D6	Parktrail	38.441	-122.652
FOR10	365 F3	St Helena	38.512	-122.639
FOR11	363 J1	Old Redwood Hwy	38.521	-122.775
FOR12	343 F1	Brooks	38.572	-122.798
FOR13	404 H2	Meda	38.417	-122.691
ORCH1	383 A3	Laguna	38.459	-122.847
ORCH 2	363 F6	River	38.490	-122.803
ORCH 3	363 F1	Conde	38.527	-122.798
ORCH 4	363 E6	Woolsey	38.484	-122.816
RANG1	424 J4	Snyder	38.355	-122.686
RANG 2	424 J3	Snyder	38.361	-122.686
RANG 3	425 B5	Petaluma Hill	38.342	-122.667
SEPT1	423 J4	Daywalt	38.352	-122.767
SEPT2	403 E6	Cooper	38.388	-122.802
SEPT3	383 A7	Occidental	38.416	-122.828
SEPT4	403 C2	High School	38.380	-122.819
SEPT5	403 C7	Elphick	38.382	-122.807
SEPT6	403 E7	Bassingnini	38.350	-122.820
SEPT7	423 D4	Bloomfield	38.348	-122.778
SEPT8	423 H4	Hessel	38.321	-122.756
SEPT9	444 A1	Roblar	38.463	-122.721
SEWR1	384 E3	Major	38.400	-122.820
SEWR2	403 C4	Petaluma	38.425	-122.772
SEWR3	403 H1	Occidental	38.472	-122.702
SEWR5	384 G2	Chanate	38.442	-122.681
SEWR6	385 B2	Rincon	38.444	-122.675
SEWR7	385 A6	Franquette	38.457	-122.752
SEWR9	385 A6	Yulupa	38.437	-122.725

Appendix B1: Water Sample Results

Below minimum detection limit (MDL) results are shown as < MDL value.

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
4/8/2009	COM2	0.101	0.098	0.608	0.042	0.608	15	15	15	5.28
4/8/2009	COM5	0.068	0.063	0.939	0.038	0.952	15	15	15	3.027
4/8/2009	FOR10	0.035	0.036	<0.025	0.040	0.049	15	15	15	3.938
4/8/2009	FOR13	0.069	0.066	0.073	0.043	0.051	15	15	15	5.484
4/8/2009	FOR2	0.029	0.029	0.041	0.041	0.056	15	15	15	4.933
4/8/2009	FOR4	0.035	0.020	0.030	0.037	0.061	15	15	15	4.069
4/8/2009	FOR6	0.033	0.024	0.048	0.039	0.059	15	15	15	4.351
4/8/2009	FOR7	0.068	0.059	0.158	0.037	0.054	15	15	15	5.375
4/8/2009	FOR8	0.040	0.041	0.293	0.065	0.077	15	15	15	3.965
4/21/2009	COM3	0.062	0.056	0.323	0.084	0.543	15	15	15	5.575
4/21/2009	CROP5	0.362	0.243	0.516	0.161	0.568	15	15	15	4.09
4/21/2009	FOR1	0.108	0.062	0.207	0.084	0.481	15	15	15	2.748
4/21/2009	FOR11	0.078	0.064	0.872	0.116	0.973	15	15	15	2.345
4/21/2009	FOR12	0.053	0.035	0.255	0.081	0.478	15	15	15	3.165
4/21/2009	FOR3	0.061	0.054	0.215	0.084	0.493	15	15	15	2.987
4/21/2009	ORCH3	0.135	0.086	0.496	0.141	0.599	15	15	15	3.733
4/21/2009	SEWR6	0.659	0.045	0.305	0.081	0.490	<15	<15	<15	3.135

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
4/23/2009	COM1	0.239	0.196	0.584	0.126	0.645	15	15	15	11.13
4/23/2009	COM6	0.670	0.473	1.020	1.035	0.448	29	15	25	5.171
4/23/2009	CROP1	0.606	0.544	1.058	0.126	0.912	15	15	15	4.219
4/23/2009	CROP2	6.675	2.350	25.300	24.400	0.525	42	35	15	30.72
4/23/2009	CROP3	0.130	0.127	0.778	0.135	0.745	15	15	15	6.734
4/23/2009	CROP4	0.803	0.660	0.911	0.163	0.506	15	15	15	16.74
4/23/2009	CROP6	0.085	0.060	0.265	0.080	0.488	15	15	15	3.035
4/23/2009	ORCH1	0.405	0.127	0.635	0.104	0.816	15	15	15	2.709
4/23/2009	ORCH2	1.760	1.295	1.435	0.650	0.494	15	15	15	11.16
4/23/2009	ORCH4	0.411	0.126	1.077	0.241	0.465	15	15	15	18.75
4/23/2009	RANG1	0.176	0.136	0.384	0.111	0.490	15	15	15	3.843
4/23/2009	RANG3	0.107	0.098	0.469	0.104	0.499	685	47	638	2.759
4/23/2009	SEPT1	0.560	0.206	0.914	0.188	0.528	15	15	15	11.43
4/23/2009	SEPT2	0.446	0.260	1.196	0.146	0.995	20	15	15	5.009
4/23/2009	SEWR1	0.453	0.393	0.658	0.117	0.667	<15	<15	<15	4.96
4/23/2009	SEWR2	0.231	0.176	1.782	0.172	1.645	24	<15	17	3.145
4/28/2009	COM3	0.174	0.074	0.306	0.097	0.531	43	15	38	5.39
4/28/2009	CROP3	0.844	0.130	0.599	0.162	0.716	15	15	15	3.709
4/28/2009	CROP4	0.855	0.638	0.854	0.268	0.540	15	15	15	12.28
4/28/2009	ORCH1	0.154	0.117	0.735	0.134	0.807	15	15	15	3.343

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
4/28/2009	ORCH2	0.859	1.665	1.077	0.362	0.550	30	15	26	18.75
4/28/2009	ORCH4	0.159	0.042	0.766	0.183	0.498	15	15	15	12.85
4/28/2009	SEPT2	0.095	0.208	1.233	0.186	1.105	26	15	18	8.973
4/28/2009	SEWR2	0.430	0.123	1.879	0.177	1.805	<15	<15	<15	3.13
5/5/2009	COM2	0.085	0.077	0.873	0.052	0.629	15	15	15	5.258
5/5/2009	COM5	0.530	0.150	1.389	0.046	1.080	15	15	15	3.105
5/5/2009	CROP1	1.130	0.650	4.225	0.778	2.120	54	30	24	21.17
5/5/2009	CROP2	18.000	6.750	128.100	115.000	0.047	551	103	448	172
5/5/2009	CROP6	0.277	0.250	1.432	0.095	1.080	15	15	15	9.397
5/5/2009	FOR13	0.155	0.080	0.602	0.106	0.097	43	37	15	14.3
5/5/2009	RANG1	0.173	0.160	0.682	0.129	0.420	17	15	15	6.15
5/5/2009	RANG2	1.005	0.673	3.078	0.534	1.655	100	90	15	19.02
5/5/2009	RANG3	0.160	0.093	0.555	0.083	0.196	36	25	15	7.174
5/5/2009	SEPT1	1.370	1.010	2.793	0.351	0.870	17	15	15	25.05
5/5/2009	SEWR3	0.200	0.196	1.343	0.110	0.902	<15	<15	<15	6.565
5/7/2009	COM1	0.109	0.088	0.929	0.090	0.627	15	15	15	4.792
5/7/2009	COM6	0.138	0.123	0.872	0.147	0.676	15	15	15	2.926
5/7/2009	CROP1	6.425	0.303	1.421	0.243	0.546	15	15	15	10.45
5/7/2009	CROP2	0.903	2.590	22.670	17.290	0.215	32	28	15	37.11
5/7/2009	CROP5	0.259	0.169	0.541	0.172	0.190	15	15	15	6.28

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
5/7/2009	CROP6	0.146	0.107	1.058	0.111	0.939	15	15	15	4.137
5/7/2009	FOR1	0.065	0.055	0.268	0.131	0.048	19	17	15	5.707
5/7/2009	FOR11	0.092	0.068	0.794	0.214	0.647	19	17	15	5.463
5/7/2009	FOR12	0.060	0.054	0.644	0.148	0.323	15	15	15	5.351
5/7/2009	FOR3	0.076	0.059	0.315	0.093	0.075	15	15	15	5.056
5/7/2009	ORCH3	0.110	0.099	1.130	0.127	0.937	20	20	15	5.127
5/7/2009	RANG1	0.111	0.088	0.422	0.085	0.148	15	15	15	4.994
5/7/2009	RANG2	0.507	0.374	1.030	0.078	0.248	15	15	15	11.48
5/7/2009	RANG3	0.076	0.080	0.269	0.071	0.065	15	15	15	3.544
5/7/2009	SEPT1	0.904	0.524	1.910	0.333	0.481	15	<15	<15	19.8
5/7/2009	SEWR1	0.269	0.221	0.747	0.165	0.399	<15	<15	<15	5.863
5/7/2009	SEWR5	0.112	0.051	0.655	0.137	0.058	<15	<15	<15	10.09
6/4/2009	COM10	0.089	0.130	1.801	0.149	1.030	15	15	15	3.514
6/4/2009	COM2	0.271	0.060	0.943	0.051	0.793	15	15	15	0.7522
6/4/2009	COM3	0.190	0.050	0.516	0.060	0.058	28	15	22	15.39
6/4/2009	COM5	0.088	0.073	0.760	0.048	0.670	15	15	15	0.3457
6/4/2009	CROP3	0.477	0.286	1.003	0.251	0.354	15	15	15	4.408
6/4/2009	CROP4	0.187	0.926	1.076	0.152	0.121	15	15	15	10.28
6/4/2009	FOR13	0.087	0.128	0.841	0.080	0.054	15	15	15	9.373
6/4/2009	FOR5	0.098	0.034	1.522	0.076	1.325	15	15	15	1.437

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
6/4/2009	ORCH1	0.346	0.122	0.608	0.108	0.371	15	15	15	2.658
6/4/2009	ORCH2	3.440	1.325	0.861	0.229	0.027	15	15	15	14.51
6/4/2009	ORCH4	1.880	0.034	0.673	0.233	0.023	15	15	15	11.88
6/4/2009	SEPT2	0.197	0.221	0.916	0.085	0.484	26	15	15	4.585
6/4/2009	SEWR2	0.202	0.143	1.706	0.114	1.380	<15	<15	<15	2.864
6/4/2009	SEWR3	0.492	0.121	0.470	0.044	0.030	<15	<15	<15	5.582
7/1/2009	CROP5	0.340	0.348	0.639	0.160	0.137	15	15	15	5.971
7/1/2009	FOR1	0.067	0.062	0.258	0.087	0.063	15	15	15	0.959
7/1/2009	FOR10	0.045	0.050	0.204	0.086	0.077	15	15	15	2.818
7/1/2009	FOR12	0.034	0.019	0.338	0.102	0.065	15	15	15	4.669
7/1/2009	FOR2	0.026	0.029	0.224	0.089	0.100	15	15	15	2.642
7/1/2009	FOR3	0.060	0.069	0.219	0.090	0.071	15	15	15	3.522
7/1/2009	FOR4	0.025	0.020	0.166	0.084	0.068	15	15	15	2.739
7/1/2009	FOR6	0.025	0.018	0.201	0.088	0.070				3.362
7/1/2009	FOR7	0.082	0.101	0.281	0.085	0.167	15	15	15	2.68
7/1/2009	FOR8	0.029	0.019	0.194	0.084	0.062	15	15	15	2.957
7/1/2009	ORCH3	0.201	0.093	0.640	0.395	0.078	15	15	15	5.06
8/4/2009	COM1	0.121	0.072	0.347	<0.08	0.045	15	15	15	5.327
8/4/2009	COM10	0.130	0.087	4.511	0.009	1.050	15	15	15	7.06
8/4/2009	CROP3	0.394	0.279	0.522	0.072	0.078	15	15	15	7.182

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
8/4/2009	CROP4	0.507	0.321	0.860	0.090	0.210	18	15	15	8.27
8/4/2009	CROP5	0.611	0.368	0.673	0.015	0.020	15	15	15	9.106
8/4/2009	FOR1	0.207	0.146	0.307	0.010	0.015	15	15	15	5.863
8/4/2009	FOR12	0.055	<0.010	0.548	<0.08	<0.010	15	15	15	10.52
8/4/2009	FOR3	0.187	0.144	0.227	<0.08	0.011	15	15	15	5.495
8/4/2009	FOR5	0.050	0.031	1.712	0.023	1.460	15	15	15	4.258
8/4/2009	ORCH1	0.168	0.110	0.709	0.025	0.320	17	15	15	5.291
8/4/2009	ORCH3	0.252	0.095	1.001	0.768	0.045	15	15	15	5.724
8/4/2009	SEPT2	0.425	0.259	0.831	0.096	0.232	15	15	15	6.469
8/4/2009	SEWR2	0.590	0.088	1.433	0.107	1.085	143	54	89	5.751
10/13/2009	CROP1	1.240	1.050	4.227	0.705	0.032	27	17	15	17.28
10/13/2009	CROP2	1.530	1.035	2.613	1.545	0.336	18	15	15	13.31
10/13/2009	CROP6	0.530	0.260	1.308	0.329	0.782	15	15	15	9.639
10/13/2009	RANG1	0.381	0.241	1.659	0.376	0.848	64	51	15	10.47
10/13/2009	SEPT1	1.525	1.255	2.182	0.244	1.045	42	32	<15	24.89
10/13/2009	SEPT2	1.285	0.433	3.131	0.437	1.955	399	261	138	17.24
10/13/2009	SEPT5	1.345	0.559	2.252	0.807	1.165	740	679	61	19.66
10/13/2009	SEPT6	5.200	0.200	1.986	0.350	1.240	1788	1535	253	17.43
10/13/2009	SEPT7	1.285	0.569	2.135	0.381	1.004	326	17	309	20.87
10/13/2009	SEPT8	0.327	0.465	1.428	0.259	0.619	19	<15	<15	7.899

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
10/13/2009	SEPT9	0.638	0.476	2.126	0.356	1.055	35	26	<15	21
10/13/2009	SEWR2	0.447	0.196	0.792	0.216	0.434	45	19	26	7.644
10/15/2009	CROP3	0.572	0.445	1.657	0.082	0.607	15	15	15	17.6
10/15/2009	CROP4	1.020	0.865	1.624	0.161	0.278	15	15	15	18.8
10/15/2009	FOR10	0.073	0.059	0.648	0.046	0.341	15	15	15	8.602
10/15/2009	FOR2	0.078	0.845	1.244	0.166	0.268	15	15	15	11.23
10/15/2009	FOR4	0.073	0.038	0.529	0.046	0.190	15	15	15	5.765
10/15/2009	FOR6	0.136	0.075	1.251	0.025	0.547	15	15	15	12.94
10/15/2009	FOR7	0.097	0.071	0.848	0.055	0.484	15	15	15	9.687
10/15/2009	FOR8	0.076	0.040	0.769	0.027	0.367	15	15	15	8.337
10/15/2009	ORCH1	0.198	0.142	0.587	0.051	0.249	16	15	15	6.171
10/15/2009	ORCH4	0.894	0.522	1.426	0.053	0.405	32	28	15	35.66
10/15/2009	SEPT3	0.901	0.420	2.972	0.099	1.415	184	80	105	27.88
12/16/2009	COM10	0.096	0.101	0.824	0.067	0.684	15	15	15	2.569
12/16/2009	COM3	0.364	0.089	0.901	0.159	0.537	72	19	53	6.135
12/16/2009	COM4	0.241	0.100	0.743	0.112	0.458	52	32	19	7.131
12/16/2009	COM5	0.127	0.099	0.740	0.076	0.431	15	15	15	5.064
12/16/2009	CROP1	0.637	0.369	1.955	0.356	1.055	34	32	15	11.85
12/16/2009	CROP2	1.285	0.614	1.846	0.705	0.850	15	15	15	9.3
12/16/2009	CROP3	0.513	0.405	1.723	0.065	1.155	15	15	15	10.91

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
12/16/2009	CROP4	0.740	0.508	1.775	0.103	0.838	31	27	15	13.25
12/16/2009	CROP6	0.321	0.270	0.649	0.036	0.326	15	15	15	8.25
12/16/2009	FOR13	0.303	0.240	0.866	0.058	0.320	19	19	15	12.92
12/16/2009	FOR5	0.065	0.052	0.889	0.057	0.698	15	15	15	5.946
12/16/2009	FOR9	0.057	0.025	0.357	0.040	0.137	15	15	15	5.304
12/16/2009	ORCH1	0.190	0.090	0.763	0.051	0.388	23	19	15	11.23
12/16/2009	ORCH2	1.100	0.803	2.130	0.098	1.170	47	43	15	15.4
12/16/2009	ORCH4	0.338	0.213	2.098	0.096	1.550	26	23	15	13.18
12/16/2009	RANG1	0.298	0.285	3.197	0.064	2.755	15	15	15	10.4
12/16/2009	RANG2	0.658	0.492	2.177	0.071	1.760	79	74	15	9.837
12/16/2009	SEPT4	0.227	0.134	2.897	0.062	2.420	146	<15	137	9.653
12/16/2009	SEWR7	0.295	0.250	0.803	0.057	0.470	<15	<15	<15	9.482
12/16/2009	SEWR9	0.450	0.397	2.502	0.062	2.130	<15	<15	<15	11.22
12/17/2009	FOR4	0.043	0.029	0.521	0.081	0.520	15	15	15	4.722
12/17/2009	FOR6	0.043	0.035	0.591	0.048	0.237	15	15	15	7.258
12/17/2009	FOR7	0.072	0.058	0.671	0.063	0.344	15	15	15	9.205
12/17/2009	SEPT1	0.486	0.335	2.974	0.180	2.020	15	<15	<15	16.47
12/17/2009	SEPT2	0.241	0.162	2.430	0.117	1.980	15	<15	<15	13.03
12/17/2009	SEPT6	0.202	0.116	2.223	0.096	1.780	<15	<15	<15	11.76
12/17/2009	SEPT7	0.319	0.225	2.654	0.086	2.095	19	<15	<15	12.29

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
12/17/2009	SEPT8	0.324	0.162	3.777	0.181	3.255	<15	<15	<15	13.89
12/17/2009	SEWR2	0.169	0.125	2.020	0.064	1.635	<15	<15	<15	10.92
1/13/2010	COM1	0.121	0.105	2.651	0.057	2.370	15	15	15	4.55
1/13/2010	COM10	0.087	0.092	0.843	0.032	0.766	15	15	15	1.429
1/13/2010	COM2	0.079	0.069	0.578	0.031	0.395	15	15	15	3.501
1/13/2010	COM3	0.332	0.079	1.014	0.043	0.806	17	15	15	3.195
1/13/2010	COM6	0.113	0.088	2.687	0.121	2.305	15	15	15	4.223
1/13/2010	CROP3	0.439	0.326	1.675	0.077	0.916	22	20	15	11.32
1/13/2010	CROP4	0.522	0.408	1.477	0.132	0.705	15	15	15	10.67
1/13/2010	CROP5	0.235	0.154	0.832	0.090	0.263	27	21	15	9.107
1/13/2010	ORCH2	1.210	0.901	3.077	0.343	1.415	67	52	15	19.92
1/13/2010	ORCH3	0.291	0.218	1.305	0.096	0.816	17	15	15	9.76
1/13/2010	ORCH4	0.391	0.218	7.826	0.098	6.965	63	51	15	13.11
1/13/2010	SEPT5	0.361	0.210	1.686	0.108	0.854	21	17	<15	21.19
1/13/2010	SEPT6	0.348	0.161	1.777	0.252	0.975	47	43	<15	16.2
1/13/2010	SEPT7	0.372	0.201	2.377	0.118	1.675	44	38	<15	14.78
1/13/2010	SEWR1	0.251	0.174	0.909	0.060	0.307	<15	<15	<15	11.72
1/13/2010	SEWR2	0.276	0.171	1.562	0.083	0.961	32	23	<15	14.07
1/13/2010	SEWR3	0.181	0.102	0.734	0.135	0.415	25	23	<15	4.148
1/13/2010	SEWR5	0.445	0.387	5.973	0.061	5.180	<15	<15	<15	14.48

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
1/13/2010	SEWR9	0.571	0.435	2.573	0.074	1.990	111	<15	100	9.155
1/19/2010	COM1	0.382	0.271	1.224	0.148	0.797	26	22	15	5.767
1/19/2010	COM4	0.185	0.051	0.278	0.115	0.040	93	46	46	3.515
1/19/2010	ORCH1	0.708	0.222	0.927	0.056	0.423	259	180	79	11.12
1/19/2010	ORCH2	1.285	0.703	1.483	0.216	0.744	161	155	15	8.058
1/19/2010	ORCH4	0.830	0.405	1.692	0.116	1.090	154	139	15	8.644
1/19/2010	RANG1	1.395	0.224	1.226	0.121	0.610	1106	1012	94	9.809
1/19/2010	RANG2	4.500	0.500	2.011	0.279	0.999	1997	1862	135	13.28
1/19/2010	RANG3	1.090	0.147	1.211	0.078	0.767	871	810	60	7.492
1/19/2010	SEWR1	0.341	0.169	0.689	0.068	0.413	63	46	17	4.596
1/19/2010	SEWR3	0.346	0.269	1.380	0.165	0.957	19	17	<15	5.271
1/19/2010	SEWR5	0.533	0.370	1.553	0.064	1.095	62	51	<15	8.793
1/26/2010	COM4	0.211	0.090	0.706	0.118	0.251	36	20	16	5.206
1/26/2010	ORCH1	0.225	0.131	0.894	0.056	0.412	25	25	15	10.99
1/26/2010	ORCH2	0.647	0.487	2.760	0.127	2.255	39	39	15	6.249
1/26/2010	ORCH3	0.147	0.085	0.902	0.035	0.524	19	19	15	6.516
1/26/2010	ORCH4	0.420	0.278	1.149	0.061	0.672	19	19	15	6.726
1/26/2010	RANG1	0.190	0.113	1.093	0.033	0.573	15	15	15	7.867
1/26/2010	RANG2	0.508	0.334	2.022	0.108	1.245	88	88	15	10.78
1/26/2010	RANG3	0.121	0.101	0.819	0.027	0.496	15	15	15	5.412

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
1/26/2010	SEWR5	0.601	0.476	1.588	0.034	0.998	<15	<15	<15	10.36
1/26/2010	SEWR7	0.107	0.080	0.974	0.047	0.253	<15	<15	<15	5.55
1/26/2010	SEWR9	0.701	0.661	1.983	0.035	1.580	<15	<15	<15	7.935
2/9/2010	ORCH1	0.203	0.085	0.677	0.050	0.313	15	15	15	10.97
2/9/2010	ORCH2	1.140	0.774	2.097	0.313	1.265	57	57	15	9.179
2/9/2010	ORCH3	0.211	0.134	0.764	0.035	0.517	15	15	15	6.165
2/9/2010	ORCH4	0.414	0.307	0.955	0.144	0.325	15	15	15	9.093
2/9/2010	RANG1	0.173	0.107	0.682	0.042	0.307	15	15	15	7.173
2/9/2010	RANG2	0.539	0.338	1.896	0.094	1.320	35	33	15	10.01
2/9/2010	RANG3	0.140	0.074		0.050	0.255	33	33	15	
2/16/2010	ORCH2	0.616	0.496	1.916	0.032	1.575	15	15	15	7.076
2/16/2010	ORCH4	0.352	0.243	0.705	0.044	0.223	15	15	15	8.27
2/16/2010	RANG1	0.141	0.098	0.921	0.034	0.714	15	15	15	5.017
2/16/2010	RANG2	0.388	0.303	1.751	0.027	1.420	15	15	15	7.661
2/16/2010	RANG3	0.087	0.085	0.353	0.023	0.229	15	15	15	3.577
2/16/2010	SEPT2	0.440	0.234	1.507	0.078	0.915	15	15	15	13.39
2/16/2010	SEPT4	0.163	0.130	1.493	0.038	0.961	15	15	15	10.51
2/16/2010	SEPT5	0.148	0.080	0.987	0.028	0.521	15	15	15	9.645
2/16/2010	SEPT6	0.288	0.145	1.386	0.050	0.907	15	15	15	12.6
2/16/2010	SEPT7	0.182	0.094	0.735	0.065	0.335	15	15	15	8.54

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
2/16/2010	SEPT8	0.311	0.098	2.911	0.099	2.280	15	15	15	13.11
2/16/2010	SEWR2	0.256	0.166	1.924	0.035	1.705	<15	<15	<15	9.515
2/17/2010	COM1	0.330	0.319	3.293	0.021	2.605	15	15	15	6.462
2/17/2010	COM10	0.075	0.073	0.698	<0.08	0.678	106	106	15	2.269
2/17/2010	COM3	0.098	0.057	0.242	0.011	0.154	15	15	15	3.948
2/17/2010	COM5	0.092	0.094	1.945	0.011	1.860	15	15	15	1.857
2/17/2010	COM6	0.063	0.035	0.641	0.035	0.509	15	15	15	2.562
2/17/2010	RANG1	0.089	0.089	0.931	<0.08	0.693	15	15	15	4.492
2/17/2010	RANG2	0.355	0.342	1.639	0.019	1.210	15	15	15	7.384
2/17/2010	RANG3	0.079	0.078	0.492	0.027	0.208	15	15	15	3.893
2/17/2010	SEWR1	0.225	0.186	0.588	0.037	0.368	<15	<15	<15	4.719
2/17/2010	SEWR3	0.119	0.093	2.580	0.038	2.290	<15	<15	<15	3.708
2/17/2010	SEWR9	0.281	0.208	1.097	0.011	1.020	<15	<15	<15	2.225
2/18/2010	COM3	0.070	0.051	0.342	0.027	0.150	15	15	15	4.058
2/18/2010	COM5	0.103	0.095	2.001	0.010	1.790	15	15	15	1.867
2/18/2010	RANG1	0.092	0.092	0.966	0.063	0.687	20	20	15	4.383
2/18/2010	RANG2	0.376	0.312	1.601	0.036	1.090	15	15	15	7.028
2/18/2010	RANG3	0.080	0.078	0.507	0.117	0.168	15	15	15	3.897
2/18/2010	SEPT1	0.873	0.551	3.101	0.123	1.490	17	15	15	21.17
2/18/2010	SEPT2	0.407	0.237	1.695	0.083	0.913	28	28	15	12.99

Sample Date	Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Suspended Solids (mg/L)	Fine Suspended Solids (63 - 0.7 um mg/L)	Coarse Suspended Solids (> 63um mg/L)	Total Organic Carbon (mg/L)
2/18/2010	SEPT4	0.165	0.139	1.410	0.058	0.695	15	15	15	10.59
2/18/2010	SEPT6	0.277	0.146	1.528	0.061	0.829	15	15	15	12.47
2/18/2010	SEPT7	0.180	0.092	0.859	0.072	0.313	45	15	36	8.45
2/18/2010	SEPT8	0.291	0.094	2.953	0.087	2.075	15	15	15	12.91
2/18/2010	SEPT9	0.088	0.033	0.765	0.031	0.074	15	15	15	10.1
2/18/2010	SEWR1	0.219	0.188	0.646	0.042	0.336	<15	<15	<15	4.756
2/18/2010	SEWR2	0.222	0.155	2.089	0.036	1.625	<15	<15	<15	8.257
2/18/2010	SEWR3	0.144	0.118	2.503	0.068	2.055	<15	<15	<15	3.369
2/18/2010	SEWR5	0.081	0.031	0.444	0.019	<0.010	15	<15	<15	7.21
2/18/2010	SEWR9	0.281	0.223	1.430	0.025	1.180	<15	<15	<15	2.446
3/8/2010	COM2	0.104	0.087	1.744	0.023	1.555	15	15	15	1.785
3/8/2010	RANG1	0.106	0.082	0.853	0.023	0.565	15	15	15	4.617
3/8/2010	RANG2	0.382	0.308	2.433	0.058	1.780	15	15	15	7.427
3/8/2010	RANG3	0.097	0.077	0.693	0.051	0.180	116	15	116	4.377
3/9/2010	RANG1	0.099	0.081	0.930	0.012	0.659	15	15	15	4.415
3/9/2010	RANG2	0.340	0.325	2.412	0.029	2.700	15	15	15	6.89
3/9/2010	RANG3	0.081	0.067		<0.08	0.198	15	15	15	

Appendix C: Water Sample Result Sample Sizes

Constituent	Commercial & Services		Residential - Sewered		Residential - Septic		Forest Land		Rangeland		Cropland & Pasture		Orchards & Vineyards	
	Number of Samples	Number <MDL	Number of Samples	Number <MDL	Number of Samples	Number <MDL	Number of Samples	Number <MDL	Number of Samples	Number <MDL	Number of Samples	Number <MDL	Number of Samples	Number <MDL
Total Phosphorus	36	0	34	0	37	0	43	0	35	0	34	0	35	0
Dissolved Phosphorus	36	0	34	0	37	0	42	1	35	0	34	0	35	0
Total Nitrogen	36	0	34	0	37	0	42	1	33	0	34	0	35	0
Ammonia-N	34	2	34	0	37	0	41	2	33	2	34	0	35	0
Nitrate + Nitrite-N	36	0	33	1	37	0	42	1	35	0	34	0	35	0
Total Suspended Solids	36	0	10	24	35	2	42	0	35	0	34	0	35	0
Coarse Suspended Solids (>63µm)	36	0	7	27	29	8	42	0	35	0	34	0	35	0
Fine Suspended Solids (<63µm)	36	0	5	29	25	12	42	0	35	0	34	0	35	0
Total Organic Carbon	36	0	34	0	37	0	43	0	33	0	34	0	35	0

Appendix D: Blank Sample Results

Constituent	Sample Date	Result (mg/L)
Total Nitrogen	4/8/2009	Not Detected
Total Nitrogen	4/21/2009	Not Detected
Total Nitrogen	4/23/2009	Not Detected
Total Nitrogen	5/7/2009	Not Detected
Total Nitrogen	6/4/2009	Not Detected
Total Nitrogen	7/1/2009	Not Detected
Total Nitrogen	10/13/2009	Not Detected
Total Nitrogen	10/15/2009	Not Detected
Total Nitrogen	12/16/2009	Not Detected
Total Nitrogen	1/19/2010	Not Detected
Total Nitrogen	1/26/2010	Not Detected
Total Nitrogen	2/9/2010	Not Detected
Total Nitrogen	2/17/2010	Not Detected
Total Nitrogen	2/18/2010	Not Detected
Total Nitrogen	3/8/2010	Not Detected
Total Nitrogen	3/9/2010	Not Detected
Ammonia	4/8/2009	0.044
Ammonia	4/21/2009	0.086
Ammonia	4/23/2009	0.085
Ammonia	5/7/2009	0.043
Ammonia	6/4/2009	Not Detected
Ammonia	7/1/2009	0.081
Ammonia	10/13/2009	Not Detected
Ammonia	10/15/2009	Not Detected
Ammonia	12/16/2009	Not Detected
Ammonia	1/19/2010	Not Detected
Ammonia	1/26/2010	Not Detected
Ammonia	2/9/2010	Not Detected
Ammonia	2/17/2010	Not Detected
Ammonia	2/18/2010	Not Detected
Ammonia	3/8/2010	Not Detected
Ammonia	3/9/2010	Not Detected
Nitrate + Nitrite	4/8/2009	Not Detected
Nitrate + Nitrite	4/21/2009	0.486

Constituent	Sample Date	Result (mg/L)
Nitrate + Nitrite	4/23/2009	0.475
Nitrate + Nitrite	5/7/2009	Not Detected
Nitrate + Nitrite	6/4/2009	Not Detected
Nitrate + Nitrite	7/1/2009	0.072
Nitrate + Nitrite	10/13/2009	Not Detected
Nitrate + Nitrite	10/15/2009	Not Detected
Nitrate + Nitrite	12/16/2009	Not Detected
Nitrate + Nitrite	1/19/2010	Not Detected
Nitrate + Nitrite	1/26/2010	Not Detected
Nitrate + Nitrite	2/9/2010	Not Detected
Nitrate + Nitrite	2/17/2010	Not Detected
Nitrate + Nitrite	2/18/2010	Not Detected
Nitrate + Nitrite	3/8/2010	Not Detected
Nitrate + Nitrite	3/9/2010	Not Detected
Total Phosphorus	4/8/2009	Not Detected
Total Phosphorus	4/21/2009	Not Detected
Total Phosphorus	4/23/2009	Not Detected
Total Phosphorus	5/7/2009	Not Detected
Total Phosphorus	6/4/2009	Not Detected
Total Phosphorus	7/1/2009	Not Detected
Total Phosphorus	10/13/2009	Not Detected
Total Phosphorus	10/15/2009	Not Detected
Total Phosphorus	12/16/2009	Not Detected
Total Phosphorus	1/19/2010	Not Detected
Total Phosphorus	1/26/2010	Not Detected
Total Phosphorus	2/9/2010	Not Detected
Total Phosphorus	2/17/2010	Not Detected
Total Phosphorus	2/18/2010	Not Detected
Total Phosphorus	3/8/2010	Not Detected
Total Phosphorus	3/9/2010	Not Detected
Dissolved Phosphorus	4/8/2009	Not Detected
Dissolved Phosphorus	4/21/2009	Not Detected
Dissolved Phosphorus	4/23/2009	Not Detected
Dissolved Phosphorus	5/7/2009	Not Detected
Dissolved Phosphorus	6/4/2009	Not Detected
Dissolved Phosphorus	7/1/2009	Not Detected

Constituent	Sample Date	Result (mg/L)
Dissolved Phosphorus	10/13/2009	Not Detected
Dissolved Phosphorus	10/15/2009	Not Detected
Dissolved Phosphorus	12/16/2009	Not Detected
Dissolved Phosphorus	1/19/2010	Not Detected
Dissolved Phosphorus	1/26/2010	Not Detected
Dissolved Phosphorus	2/9/2010	Not Detected
Dissolved Phosphorus	2/17/2010	Not Detected
Dissolved Phosphorus	2/18/2010	Not Detected
Dissolved Phosphorus	3/8/2010	Not Detected
Dissolved Phosphorus	3/9/2010	Not Detected
Total Suspended Solids	4/8/2009	Not Detected
Total Suspended Solids	4/21/2009	Not Detected
Total Suspended Solids	4/23/2009	Not Detected
Total Suspended Solids	5/7/2009	Not Detected
Total Suspended Solids	7/1/2009	Not Detected
Total Suspended Solids	10/13/2009	Not Detected
Total Suspended Solids	10/15/2009	Not Detected
Total Suspended Solids	12/16/2009	Not Detected
Total Suspended Solids	1/19/2010	Not Detected
Total Suspended Solids	1/26/2010	Not Detected
Total Suspended Solids	2/9/2010	Not Detected
Total Suspended Solids	2/17/2010	Not Detected
Total Suspended Solids	2/18/2010	Not Detected
Total Suspended Solids	3/8/2010	Not Detected
Total Suspended Solids	3/9/2010	Not Detected
Total Organic Carbon	4/8/2009	2.771
Total Organic Carbon	4/21/2009	1.004
Total Organic Carbon	4/23/2009	0.470
Total Organic Carbon	5/7/2009	1.137
Total Organic Carbon	6/4/2009	0.294
Total Organic Carbon	7/1/2009	1.303
Total Organic Carbon	10/13/2009	1.183
Total Organic Carbon	10/15/2009	1.187
Total Organic Carbon	12/16/2009	1.042
Total Organic Carbon	1/19/2010	0.715
Total Organic Carbon	1/26/2010	0.632

Constituent	Sample Date	Result (mg/L)
Total Organic Carbon	2/9/2010	1.194
Total Organic Carbon	2/17/2010	1.639
Total Organic Carbon	2/18/2010	1.195
Total Organic Carbon	3/8/2010	1.064
Total Organic Carbon	3/9/2010	1.083

Appendix E: Replicate Sample Results

Constituent	Sample Date	Site_ID	Triplicate Median (mg/L)	Triplicate Mean (mg/L)	90% Confidence Level (mg/L)	Median Confidence Level (mg/L)
Total Nitrogen	4/8/2009	FOR10	-0.013	-0.015	0.034	0.030
	4/28/2009	CROP4	0.854	0.846	0.040	
	4/28/2009	ORCH1	0.735	0.739	0.014	
	5/5/2009	CROP6	1.432	1.477	0.087	
	5/5/2009	RANG1	0.682	0.692	0.027	
	5/7/2009	SEPT1	1.910	1.905	0.029	
	5/7/2009	SEWR1	0.747	0.745	0.021	
	6/4/2009	COM5	0.760	0.781	0.047	
	6/4/2009	SEWR2	1.706	1.679	0.053	
	7/1/2009	FOR12	0.338	0.338	0.030	
	8/4/2009	FOR5	1.712	1.722	0.035	
	12/16/2009	COM5	0.740	0.737	0.013	
	12/16/2009	ORCH4	2.098	2.099	0.011	
	2/16/2010	RANG1	0.921	0.914	0.033	
	2/18/2010	SEPT6	1.528	1.526	0.008	
Ammonia-N	4/8/2009	FOR10	0.040	0.039	0.003	0.011
	4/28/2009	CROP4	0.268	0.243	0.052	
	4/28/2009	ORCH1	0.134	0.129	0.010	
	5/5/2009	CROP6	0.095	0.095	0.002	
	5/5/2009	RANG1	0.129	0.123	0.012	
	5/7/2009	SEPT1	0.333	0.331	0.052	
	5/7/2009	SEWR1	0.165	0.166	0.025	
	6/4/2009	COM5	0.048	0.049	0.004	
	6/4/2009	SEWR2	0.114	0.116	0.011	
	7/1/2009	FOR12	0.102	0.101	0.002	
	12/16/2009	COM5	0.076	0.080	0.016	
	12/16/2009	ORCH4	0.096	0.101	0.025	
	2/16/2010	RANG1	0.034	0.033	0.001	
	2/18/2010	SEPT6	0.061	0.062	0.011	

Constituent	Sample Date	Site_ID	Triplicate Median (mg/L)	Triplicate Mean (mg/L)	90% Confidence Level (mg/L)	Median Confidence Level (mg/L)
Nitrate + Nitrite-N	4/8/2009	FOR10	0.049	0.047	0.008	0.011
	4/28/2009	CROP4	0.540	0.536	0.013	
	4/28/2009	ORCH1	0.807	0.807	0.001	
	5/5/2009	CROP6	1.080	1.095	0.033	
	5/5/2009	RANG1	0.420	0.421	0.005	
	5/7/2009	SEPT1	0.481	0.478	0.035	
	5/7/2009	SEWR1	0.399	0.399	0.002	
	6/4/2009	COM5	0.670	0.672	0.016	
	6/4/2009	SEWR2	1.380	1.375	0.014	
	7/1/2009	FOR12	0.065	0.066	0.003	
	12/16/2009	COM5	0.431	0.434	0.016	
	12/16/2009	ORCH4	1.550	1.548	0.035	
	2/16/2010	RANG1	0.714	0.715	0.011	
	2/18/2010	SEPT6	0.829	0.831	0.006	
Total Phosphorus	4/8/2009	FOR10	0.035	0.039	0.007	0.004
	4/28/2009	CROP4	0.855	0.625	0.440	
	4/28/2009	ORCH1	0.154	0.154	0.004	
	5/5/2009	CROP6	0.277	0.274	0.008	
	5/5/2009	RANG1	0.173	0.167	0.013	
	5/7/2009	SEPT1	0.904	0.774	0.273	
	5/7/2009	SEWR1	0.269	0.269	0.004	
	6/4/2009	COM5	0.088	0.113	0.049	
	6/4/2009	SEWR2	0.202	0.523	0.615	
	7/1/2009	FOR12	0.034	0.032	0.004	
	12/16/2009	COM5	0.127	0.128	0.002	
	12/16/2009	ORCH4	0.338	0.338	0.004	
	2/16/2010	RANG1	0.141	0.141	0.000	
	2/18/2010	SEPT6	0.277	0.276	0.002	
Dissolved Phosphorus	4/8/2009	FOR10	0.036	0.036	0.000	0.006

Constituent	Sample Date	Site_ID	Triplicate Median (mg/L)	Triplicate Mean (mg/L)	90% Confidence Level (mg/L)	Median Confidence Level (mg/L)
	4/28/2009	CROP4	0.638	0.642	0.009	
	4/28/2009	ORCH1	0.117	0.117	0.001	
	5/5/2009	CROP6	0.250	0.252	0.006	
	5/5/2009	RANG1	0.160	0.157	0.006	
	5/7/2009	SEPT1	0.524	0.521	0.015	
	5/7/2009	SEWR1	0.221	0.222	0.004	
	6/4/2009	COM5	0.073	0.071	0.007	
	6/4/2009	SEWR2	0.143	0.141	0.005	
	7/1/2009	FOR12	0.019	0.019	0.001	
	12/16/2009	COM5	0.099	0.101	0.004	
	12/16/2009	ORCH4	0.213	0.213	0.004	
	2/16/2010	RANG1	0.098	0.096	0.008	
	2/18/2010	SEPT6	0.146	0.146	0.007	
Total Suspended Solids	4/8/2009	FOR10	0.000	2.095	3.951	2.275
	4/28/2009	CROP4	0.004	3.553	1.361	
	4/28/2009	ORCH1	0.006	6.233	2.145	
	5/5/2009	CROP6	0.007	7.197	1.367	
	5/5/2009	RANG1	0.017	16.753	0.066	
	5/7/2009	SEPT1	0.010	9.019	2.625	
	5/7/2009	SEWR1	0.000	1.409	2.656	
	6/4/2009	COM5	0.000	0.000	0.000	
	6/4/2009	SEWR2	0.002	2.261	2.474	
	7/1/2009	FOR12	0.002	2.100	0.097	
	12/16/2009	COM5	0.002	3.522	2.685	
	12/16/2009	ORCH4	0.026	25.386	4.970	
	2/16/2010	ORCH4	0.004	4.207	0.008	
	2/16/2010	RANG1	0.002	2.087	2.275	
2/18/2010	SEPT6	0.009	9.596	3.229		
Total Organic Carbon	4/8/2009	FOR10	3.938	3.875	0.601	0.162
	4/28/2009	CROP4	12.280	13.111	4.718	

Constituent	Sample Date	Site_ID	Triplicate Median (mg/L)	Triplicate Mean (mg/L)	90% Confidence Level (mg/L)	Median Confidence Level (mg/L)
	4/28/2009	ORCH1	3.343	3.205	0.300	
	5/5/2009	CROP6	9.397	9.406	0.042	
	5/5/2009	RANG1	6.150	6.156	0.122	
	5/7/2009	SEPT1	19.800	19.753	0.098	
	5/7/2009	SEWR1	5.863	5.951	0.183	
	6/4/2009	COM5	0.346	0.395	0.165	
	6/4/2009	SEWR2	2.864	2.854	0.368	
	7/1/2009	FOR12	4.669	4.669	0.075	
	8/4/2009	FOR5	4.258	4.300	0.162	
	12/16/2009	COM5	5.064	5.223	0.411	
	12/16/2009	ORCH4	13.180	13.150	0.097	
	2/16/2010	RANG1	5.017	4.970	0.146	
	2/18/2010	SEPT6	12.470	12.477	0.033	

Appendix F. Constituent Concentrations collected in 2008

Sample Date	2009 Site ID	2008 Site ID	Total Phosphorus (mg/L)	Dissolved Phosphorus (mg/L)	Total Nitrogen (mg/L)	Ammonia-N (mg/L)	Nitrate+Nitrite-N (mg/L)
6/11/2008	CROP1	WAS1	0.460	0.430	0.070	0.100	0.070
6/11/2008	CROP2	GOS1	0.820	0.780	0.280	0.170	0.280
6/11/2008	CROP3	ABR1	0.300	0.300	0.290	0.160	0.290
6/11/2008	SEPT1	TUR1	0.240	0.100	0.040	0.520	0.040
6/11/2008	SEPT1	TUR1	0.160	0.170	0.470	0.080	0.470
6/18/2008	CROP1	WAS1	0.620	0.560	0.020	0.140	0.020
6/18/2008	CROP2	GOS1	0.990	0.920	0.230	0.130	0.230
6/18/2008	CROP3	ABR1	0.410	0.250	0.260	0.350	0.260
6/18/2008	SEPT1	TUR1	1.690	1.520	0.020	1.090	0.020
6/18/2008	SEPT1	TUR1	0.250	0.150	0.430	0.080	0.430
6/24/2008	CROP1	WAS1	0.410	0.380	0.070	0.160	0.070
6/24/2008	CROP2	GOS1	3.040	1.000	0.200	0.180	0.200
6/24/2008	CROP3	ABR1	0.400	0.320	0.170	0.110	0.170
6/24/2008	SEPT1	TUR1	1.870	1.650	0.020	0.190	0.020
6/24/2008	SEPT1	TUR1	0.160	0.130	0.230	0.100	0.230
9/11/2008	CROP2	GOS1	1.310	1.010	0.060	0.150	0.060
9/11/2008	SEPT1	TUR1	0.150	0.140	0.340	0.070	0.340
9/11/2008	SEWR2	DSEB	0.180	0.160	1.700	0.180	1.700
9/17/2008	CROP2	GOS1	0.770	0.800	0.060	0.150	0.060
9/17/2008	SEPT1	TUR1	0.120	0.140	0.420	0.080	0.420
9/17/2008	SEWR2	DSEB	0.440	0.460	1.900	0.240	1.900
9/29/2008	CROP2	GOS1	0.730	0.590	0.080	0.070	0.080
9/29/2008	SEPT1	TUR1	0.150	0.130	0.390	0.060	0.390
9/29/2008	SEWR2	DSEB	0.150	0.110	1.730	0.120	1.730

Appendix G1. Descriptive Statistics for All Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	278	0.241	0.527	0.025	18.000	248	9.7
	Dry	141	0.202	0.409	0.025	6.675	177	5.8
	Wet	137	0.295	0.649	0.029	18.000	263	8.3
Dissolved Phosphorus	All	278	0.144	0.295	0.005	6.750	175	8.0
	Dry	141	0.130	0.262	0.005	2.350	138	3.1
	Wet	137	0.171	0.329	0.020	6.750	194	8.0
Total Nitrogen	All	276	0.905	1.816	0.013	128.100	437	14.9
	Dry	140	0.722	1.100	0.020	25.300	200	9.7
	Wet	136	1.225	2.553	0.013	128.100	433	11.1
Ammonia-N	All	278	0.085	0.696	0.004	115.000	1022	15.3
	Dry	141	0.084	0.292	0.004	24.400	703	11.8
	Wet	137	0.093	1.111	0.025	115.000	892	11.3
Nitrate + Nitrite-N	All	278	0.525	0.752	0.005	6.965	104	3.0
	Dry	141	0.490	0.640	0.005	2.700	97	1.3
	Wet	137	0.627	0.868	0.032	6.965	105	3.3
Total Suspended Solids	All	253	15	58	8	1997	350	7.2
	Dry	116	15	24	8	685	265	9.6
	Wet	137	15	86	8	1997	308	5.5
Fine Suspended Solids	All	253	8	40	8	1862	443	8.1
	Dry	116	8	10	8	106	116	6.8
	Wet	137	8	65	8	1862	362	5.9
Coarse Suspended Solids	All	253	15	24	8	638	229	7.9
	Dry	116	15	22	8	638	273	10.1
	Wet	137	15	27	8	448	199	5.5
Total Organic Carbon	All	252	7	9	0	172	129	10.7
	Dry	116	5	7	0	31	72	1.9
	Wet	136	9	11	1	172	134	9.0

Appendix G2. Descriptive Statistics for Cropland and Pasture Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	46	0.589	1.301	0.085	18.000	218	5.0
	Dry	26	0.556	0.890	0.085	6.675	147	3.9
	Wet	20	0.604	1.836	0.146	18.000	220	3.8
Dissolved Phosphorus	All	46	0.407	0.699	0.060	6.750	148	4.8
	Dry	26	0.405	0.562	0.060	2.350	82	2.5
	Wet	20	0.407	0.876	0.107	6.750	170	3.6
Total Nitrogen	All	46	0.857	4.775	0.020	128.100	402	6.2
	Dry	26	0.403	1.417	0.020	25.300	345	5.1
	Wet	20	1.666	9.140	0.541	128.100	311	4.3
Ammonia-N	All	46	0.156	3.613	0.015	115.000	480	6.2
	Dry	26	0.151	1.081	0.015	24.400	440	5.1
	Wet	20	0.167	6.904	0.036	115.000	373	4.3
Nitrate + Nitrite-N	All	46	0.308	0.456	0.020	2.120	91	1.6
	Dry	26	0.220	0.296	0.020	0.912	85	0.9
	Wet	20	0.656	0.664	0.032	2.120	75	1.2
Total Suspended Solids	All	34	15	35	15	551	259	5.7
	Dry	14	15	17	15	42	42	3.7
	Wet	20	15	48	15	551	247	4.4
Fine Suspended Solids	All	34	8	15	8	103	121	4.0
	Dry	14	8	9	8	35	79	3.7
	Wet	20	8	18	8	103	119	3.4
Coarse Suspended Solids	All	34	15	28	15	448	265	5.8
	Dry	14	15	15	15	15	0	
	Wet	20	15	37	15	448	261	4.5
Total Organic Carbon	All	34	10	16	3	172	177	5.3
	Dry	14	7	9	3	31	81	2.3
	Wet	20	11	21	4	172	172	4.2

Appendix G3. Descriptive Statistics for Orchards, Groves, Vineyards and Horticultural Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	35	0.391	0.631	0.110	3.440	107	2.6
	Dry	15	0.352	0.742	0.135	3.440	125	2.1
	Wet	20	0.402	0.547	0.110	1.285	72	0.7
Dissolved Phosphorus	All	35	0.213	0.365	0.034	1.665	111	1.8
	Dry	15	0.122	0.398	0.034	1.665	138	1.6
	Wet	20	0.220	0.341	0.085	0.901	78	1.0
Total Nitrogen	All	35	0.955	1.371	0.496	7.826	94	4.0
	Dry	15	0.735	0.889	0.496	1.916	42	1.8
	Wet	20	1.227	1.732	0.587	7.826	92	3.2
Ammonia-N	All	35	0.108	0.168	0.025	0.768	101	2.2
	Dry	15	0.183	0.243	0.025	0.768	90	1.4
	Wet	20	0.096	0.111	0.035	0.343	78	1.8
Nitrate + Nitrite-N	All	35	0.517	0.838	0.023	6.965	140	4.4
	Dry	15	0.465	0.459	0.023	1.575	88	1.5
	Wet	20	0.708	1.122	0.249	6.965	131	3.6
Total Suspended Solids	All	35	17	38	15	259	136	3.2
	Dry	15	15	16	15	30	24	3.7
	Wet	20	25	55	15	259	118	2.3
Fine Suspended Solids	All	35	8	29	8	180	147	2.6
	Dry	15	8	8	8	8	0	
	Wet	20	24	45	8	180	114	1.8
Coarse Suspended Solids	All	35	15	17	15	79	63	5.7
	Dry	15	15	16	15	26	18	3.9
	Wet	20	15	18	15	79	78	4.5
Total Organic Carbon	All	35	9	10	3	36	62	2.1
	Dry	15	7	9	3	19	63	0.7
	Wet	20	9	11	5	36	61	2.7

Appendix G4. Descriptive Statistics for Sewered Residential Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	37	0.276	0.323	0.081	0.701	52	0.6
	Dry	19	0.231	0.297	0.081	0.659	55	0.9
	Wet	18	0.318	0.349	0.107	0.701	50	0.4
Dissolved Phosphorus	All	37	0.174	0.214	0.031	0.661	66	1.3
	Dry	19	0.155	0.168	0.031	0.460	63	1.7
	Wet	18	0.209	0.263	0.051	0.661	61	0.9
Total Nitrogen	All	37	1.433	1.504	0.305	5.973	67	2.5
	Dry	19	1.700	1.414	0.305	2.580	50	-0.2
	Wet	18	1.362	1.599	0.655	5.973	78	2.7
Ammonia-N	All	37	0.068	0.089	0.011	0.240	66	0.9
	Dry	19	0.068	0.087	0.011	0.240	76	0.9
	Wet	18	0.066	0.091	0.034	0.216	57	1.1
Nitrate + Nitrite-N	All	37	1.020	1.167	0.005	5.180	82	2.0
	Dry	19	1.380	1.211	0.005	2.290	59	-0.4
	Wet	18	0.930	1.121	0.058	5.180	106	2.6
Total Suspended Solids	All	34	8	21	8	143	146	2.9
	Dry	16	8	18	8	143	193	3.9
	Wet	18	8	24	8	111	118	2.0
Fine Suspended Solids	All	34	8	13	8	54	99	2.5
	Dry	16	8	10	8	54	112	4.0
	Wet	18	8	15	8	51	90	2.0
Coarse Suspended Solids	All	34	8	14	8	100	152	3.8
	Dry	16	8	13	8	89	154	3.9
	Wet	18	8	14	8	100	155	4.0
Total Organic Carbon	All	34	6	7	2	14	49	0.6
	Dry	16	4	5	2	10	46	1.0
	Wet	18	9	9	4	14	35	0.2

Appendix G5. Descriptive Statistics for Septic System Residential Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	46	0.321	0.608	0.088	5.200	137	4.0
	Dry	27	0.240	0.382	0.088	1.870	115	2.7
	Wet	19	0.486	0.929	0.202	5.200	122	3.3
Dissolved Phosphorus	All	46	0.201	0.325	0.033	1.650	110	2.5
	Dry	27	0.145	0.272	0.033	1.650	143	3.1
	Wet	19	0.335	0.401	0.116	1.255	76	1.7
Total Nitrogen	All	46	1.518	1.619	0.020	3.777	62	0.1
	Dry	27	0.914	1.066	0.020	3.101	80	1.1
	Wet	19	2.252	2.406	1.428	3.777	24	0.5
Ammonia-N	All	46	0.100	0.188	0.028	1.090	108	2.7
	Dry	27	0.080	0.142	0.028	1.090	149	3.9
	Wet	19	0.244	0.253	0.062	0.807	71	1.7
Nitrate + Nitrite-N	All	46	0.910	0.998	0.020	3.255	74	0.9
	Dry	27	0.484	0.667	0.020	2.280	86	1.4
	Wet	19	1.240	1.469	0.481	3.255	48	0.9
Total Suspended Solids	All	37	17	114	8	1788	277	4.6
	Dry	18	15	19	15	45	41	2.4
	Wet	19	35	205	8	1788	209	3.2
Fine Suspended Solids	All	37	8	80	8	1535	341	4.8
	Dry	18	8	9	8	28	57	4.2
	Wet	19	17	147	8	1535	253	3.4
Coarse Suspended Solids	All	37	15	38	8	309	179	3.0
	Dry	18	15	16	15	36	31	4.1
	Wet	19	8	58	8	309	156	1.9
Total Organic Carbon	All	37	13	14	5	28	40	0.6
	Dry	18	11	11	5	21	35	0.8
	Wet	19	17	17	8	28	31	0.1

Appendix G6. Descriptive Statistics for Commercial and Services Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	36	0.117	0.176	0.062	0.670	79	2.0
	Dry	18	0.103	0.165	0.062	0.670	89	2.7
	Wet	18	0.124	0.187	0.068	0.530	70	1.4
Dissolved Phosphorus	All	36	0.088	0.109	0.035	0.473	78	3.0
	Dry	18	0.074	0.116	0.035	0.473	96	2.5
	Wet	18	0.091	0.102	0.051	0.271	47	2.9
Total Nitrogen	All	36	0.857	1.134	0.242	4.511	82	2.0
	Dry	18	0.729	1.223	0.242	4.511	95	1.7
	Wet	18	0.872	1.044	0.278	2.687	61	2.0
Ammonia-N	All	36	0.052	0.092	0.004	1.035	184	5.3
	Dry	18	0.031	0.100	0.004	1.035	237	4.0
	Wet	18	0.071	0.083	0.031	0.159	53	0.4
Nitrate + Nitrite-N	All	36	0.657	0.820	0.040	2.605	79	1.4
	Dry	18	0.657	0.840	0.045	2.605	84	1.1
	Wet	18	0.652	0.801	0.040	2.370	76	1.9
Total Suspended Solids	All	36	15	25	15	106	89	2.7
	Dry	18	15	23	15	106	95	3.5
	Wet	18	15	26	15	93	86	2.1
Fine Suspended Solids	All	36	8	13	8	106	137	4.5
	Dry	18	8	13	8	106	179	4.2
	Wet	18	8	13	8	46	83	2.1
Coarse Suspended Solids	All	36	15	18	15	53	49	3.1
	Dry	18	15	17	15	38	34	3.1
	Wet	18	15	19	15	53	59	2.7
Total Organic Carbon	All	36	4	4	0	15	63	1.9
	Dry	18	4	5	0	15	80	1.6
	Wet	18	4	4	1	7	34	0.0

Appendix G7. Descriptive Statistics for Range Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	35	0.173	0.431	0.076	4.500	179	4.6
	Dry	17	0.106	0.181	0.079	0.388	70	0.9
	Wet	18	0.339	0.668	0.076	4.500	154	3.4
Dissolved Phosphorus	All	35	0.113	0.202	0.067	0.673	75	1.3
	Dry	17	0.092	0.156	0.067	0.342	70	1.0
	Wet	18	0.192	0.246	0.074	0.673	71	1.1
Total Nitrogen	All	33	0.966	1.253	0.269	3.197	63	0.9
	Dry	16	0.925	1.083	0.353	2.433	63	1.0
	Wet	17	1.211	1.413	0.269	3.197	62	0.7
Ammonia-N	All	35	0.063	0.087	0.004	0.534	122	3.0
	Dry	17	0.029	0.043	0.004	0.117	82	1.1
	Wet	18	0.080	0.129	0.027	0.534	103	2.2
Nitrate + Nitrite-N	All	35	0.610	0.804	0.065	2.755	85	1.4
	Dry	17	0.659	0.793	0.168	2.700	85	1.6
	Wet	18	0.591	0.815	0.065	2.755	87	1.4
Total Suspended Solids	All	35	15	159	15	1997	256	3.5
	Dry	17	15	61	15	685	268	4.0
	Wet	18	34	252	15	1997	213	2.6
Fine Suspended Solids	All	35	8	123	8	1862	300	3.9
	Dry	17	8	11	8	47	93	3.6
	Wet	18	29	230	8	1862	217	2.6
Coarse Suspended Solids	All	35	15	43	15	638	252	5.3
	Dry	17	15	58	15	638	263	4.0
	Wet	18	15	29	15	135	118	2.5
Total Organic Carbon	All	33	7	7	3	19	48	1.4
	Dry	16	4	5	3	8	31	0.6
	Wet	17	10	9	4	19	40	1.1

Appendix G8. Descriptive Statistics for Forested Land Use Samples

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	43	0.065	0.076	0.025	0.303	71	2.5
	Dry	19	0.060	0.072	0.025	0.207	69	1.7
	Wet	24	0.068	0.078	0.029	0.303	73	3.0
Dissolved Phosphorus	All	43	0.054	0.075	0.005	0.845	169	5.5
	Dry	19	0.050	0.057	0.005	0.146	75	1.0
	Wet	24	0.054	0.090	0.020	0.845	185	4.4
Total Nitrogen	All	43	0.315	0.494	0.013	1.712	82	1.2
	Dry	19	0.255	0.463	0.166	1.712	99	2.0
	Wet	24	0.560	0.519	0.013	1.251	71	0.3
Ammonia-N	All	43	0.076	0.071	0.004	0.214	59	1.1
	Dry	19	0.084	0.071	0.004	0.116	47	-1.3
	Wet	24	0.051	0.071	0.025	0.214	68	1.7
Nitrate + Nitrite-N	All	43	0.100	0.281	0.005	1.460	119	2.0
	Dry	19	0.071	0.318	0.005	1.460	143	'''
	Wet	24	0.213	0.252	0.048	0.698	82	0.8
Total Suspended Solids	All	42	15	16	15	43	28	5.9
	Dry	18	15	15	15	15	0	0.0
	Wet	24	15	17	15	43	35	4.4
Fine Suspended Solids	All	42	8	9	8	37	58	4.4
	Dry	18	8	8	8	8	0	0.0
	Wet	24	8	10	8	37	67	3.2
Coarse Suspended Solids	All	42	15	15	15	15	0	0.0
	Dry	18	15	15	15	15	0	0.0
	Wet	24	15	15	15	15	0	0.0
Total Organic Carbon	All	43	5	6	1	14	57	1.1
	Dry	19	3	4	1	11	62	1.7
	Wet	24	6	7	4	14	44	1.1

Appendix G9. Descriptive Statistics for Cropland and Pasture Land Use Samples without data from the outlier sampling location CROP2

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	35	0.477	0.680	6.425	0.085	152	5.3
	Dry	19	0.410	0.463	0.855	0.085	48	0.3
	Wet	16	0.526	0.938	6.425	0.146	160	3.7
Dissolved Phosphorus	All	35	0.326	0.392	1.050	0.060	59	1.2
	Dry	19	0.321	0.377	0.926	0.060	56	1.0
	Wet	16	0.347	0.409	1.050	0.107	63	1.4
Total Nitrogen	All	35	0.860	1.092	4.227	0.020	87	2.0
	Dry	19	0.599	0.560	1.076	0.020	63	-0.1
	Wet	16	1.551	1.724	4.227	0.541	61	1.8
Ammonia-N	All	35	0.140	0.182	0.778	0.015	89	2.6
	Dry	19	0.152	0.150	0.350	0.015	50	1.0
	Wet	16	0.121	0.221	0.778	0.036	101	1.8
Nitrate + Nitrite-N	All	35	0.488	0.517	2.120	0.020	85	1.5
	Dry	19	0.260	0.330	0.912	0.020	82	0.7
	Wet	16	0.743	0.739	2.120	0.032	68	1.2
Total Suspended Solids	All	29	15	19	54	15	46	2.9
	Dry	13	15	15	18	15	5	3.6
	Wet	16	15	22	54	15	50	2.0
Fine Suspended Solids	All	29	7.5	11	32	8	67	1.9
	Dry	13	7.5	8	8	8	0	
	Wet	16	7.5	14	32	8	66	1.0
Coarse Suspended Solids	All	29	15	15	24	15	11	5.4
	Dry	13	15	15	15	15	0	
	Wet	16	15	16	24	15	14	4.0
Total Organic Carbon	All	29	9	10	21	3	49	0.7
	Dry	13	7	7	17	3	54	1.2
	Wet	16	11	12	21	4	39	0.6

Appendix G10. Descriptive Statistics for Orchards, Groves, Vineyards and Horticultural Land Use Samples without data from the outlier sampling location ORCH2

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	26	0.271	0.386	0.110	1.880	95	3.0
	Dry	11	0.252	0.406	0.135	1.880	123	3.1
	Wet	15	0.291	0.371	0.110	0.894	67	1.2
Dissolved Phosphorus	All	26	0.126	0.167	0.034	0.522	68	1.7
	Dry	11	0.110	0.108	0.034	0.243	50	1.3
	Wet	15	0.213	0.210	0.085	0.522	60	1.3
Total Nitrogen	All	26	0.830	1.198	0.496	7.826	117	4.6
	Dry	11	0.705	0.731	0.496	1.077	23	1.1
	Wet	15	0.955	1.540	0.587	7.826	116	3.5
Ammonia-N	All	26	0.097	0.134	0.025	0.768	114	3.2
	Dry	11	0.141	0.216	0.025	0.768	97	2.1
	Wet	15	0.056	0.075	0.035	0.144	46	0.7
Nitrate + Nitrite-N	All	26	0.444	0.763	0.023	6.965	172	4.6
	Dry	11	0.371	0.386	0.023	0.816	73	0.2
	Wet	15	0.517	1.039	0.249	6.965	161	3.6
Total Suspended Solids	All	26	16	34	15	259	158	3.6
	Dry	11	15	15	15	17	4	3.1
	Wet	15	20	48	15	259	143	2.7
Fine Suspended Solids	All	26	8	25	8	180	167	3.2
	Dry	11	8	8	8	8	0	
	Wet	15	19	37	8	180	138	2.3
Coarse Suspended Solids	All	26	15	17	15	79	71	5.1
	Dry	11	15	15	15	15	0	
	Wet	15	15	19	15	79	85	3.9
Total Organic Carbon	All	26	8	9	3	36	70	2.6
	Dry	11	5	7	3	19	71	1.3
	Wet	15	10	11	5	36	67	3.1

Appendix G11. Descriptive Statistics for Range Land Use Samples without data from the outlier sampling location RANG2

Constituent	Season	Sample Size	Median (mg/L)	Mean (mg/L)	Minimum (mg/L)	Maximum (mg/L)	CV (%)	Skewness
Total Phosphorus	All	24	0.116	0.231	0.076	1.395	140	3.1
	Dry	12	0.094	0.103	0.079	0.176	28	1.9
	Wet	12	0.173	0.359	0.076	1.395	119	2.0
Dissolved Phosphorus	All	24	0.093	0.115	0.067	0.285	50	1.9
	Dry	12	0.083	0.088	0.067	0.136	20	1.9
	Wet	12	0.110	0.143	0.074	0.285	49	1.0
Total Nitrogen	All	22	0.756	0.878	0.269	3.197	71	2.7
	Dry	11	0.693	0.682	0.353	0.966	36	-0.1
	Wet	11	0.819	1.074	0.269	3.197	76	2.0
Ammonia-N	All	24	0.057	0.072	0.004	0.376	104	3.0
	Dry	12	0.030	0.048	0.004	0.117	87	0.8
	Wet	12	0.074	0.096	0.027	0.376	97	2.8
Nitrate + Nitrite-N	All	24	0.493	0.530	0.065	2.755	99	3.4
	Dry	12	0.495	0.441	0.168	0.714	52	-0.1
	Wet	12	0.458	0.620	0.065	2.755	115	2.8
Total Suspended Solids	All	24	15	132	15	1106	226	2.6
	Dry	12	15	80	15	685	242	3.3
	Wet	12	16	185	15	1106	205	2.1
Fine Suspended Solids	All	24	8	89	8	1012	288	3.3
	Dry	12	8	12	8	47	98	3.0
	Wet	12	8	165	8	1012	212	2.1
Coarse Suspended Solids	All	24	15	50	15	638	254	4.6
	Dry	12	15	75	15	638	238	3.3
	Wet	12	15	25	15	94	99	2.4
Total Organic Carbon	All	22	5	6	3	10	40	1.0
	Dry	11	4	4	3	5	15	-0.9
	Wet	11	7	7	4	10	31	0.0

Appendix H. Sites with significant difference ($\alpha = 0.05$) from the remaining set of data collected for the same land use category and weather period.

Site ID	Period	Constituent	Probability
COM3	Dry	Total Nitrogen	0.023
COM4		Total Suspended Solids	0.022
		Nitrate+Nitrite-N	0.039
COM10	Wet	Total Organic Carbon	0.044
CROP2	Dry	Dissolved Phosphorus	0.008
		Total Phosphorus	0.010
		Total Suspended Solids	0.031
	Wet	Ammonia-N	0.016
		Dissolved Phosphorus	0.030
		Total Nitrogen	0.036
		Total Phosphorus	0.044
CROP3	Dry	Dissolved Phosphorus	0.016
	Wet	Ammonia-N	0.040
CROP4	Dry	Total Nitrogen	0.038
CROP6	Wet	Dissolved Phosphorus	0.044
FOR1	Wet	Total Suspended Solids	0.039
FOR4	Wet	Dissolved Phosphorus	0.033
ORCH1	Dry	Total Organic Carbon	0.045
	Wet	Total Nitrogen	0.019
		Nitrate+Nitrite-N	0.027
ORCH2	Dry	Dissolved Phosphorus	0.028
	Wet	Dissolved Phosphorus	0.013
		Total Phosphorus	0.019
		Ammonia-N	0.023
		Total Nitrogen	0.045
RANG2	Dry	Dissolved Phosphorus	0.019
		Nitrate+Nitrite-N	0.019
		Total Phosphorus	0.019
		Total Nitrogen	0.023
		Total Organic Carbon	0.023
	Wet	Dissolved Phosphorus	0.016
		Total Organic Carbon	0.042
RANG3	Dry	Nitrate+Nitrite-N	0.025
		Total Organic Carbon	0.043
	Wet	Dissolved Phosphorus	0.040
SEPT1	Dry	Total Nitrogen	0.028
SEPT2	Dry	Dissolved Phosphorus	0.036
SEPT8	Dry	Nitrate+Nitrite-N	0.031
		Total Nitrogen	0.048
SEWR9	Dry	Total Organic Carbon	0.049
	Wet	Dissolved Phosphorus	0.039