APPENDIX M

Mariposa Lakes Water Quality Modeling
August 8, 2006

City of Stockton
c/o Mr. David Wade
Wade & Associates
7777 Campus Common Drive, Suite 200
Sacramento, Ca 95825
(703) 236-7488

Re: Comments for Mariposa Lakes On-Site Water Quality Modeling Report, prepared by PACE April 7, 2006 #8013E

Dear Mr. Wade,

Pacific Advanced Civil Engineering, Inc. (PACE) is pleased to provide the following responses to the City of Stockton Community Development Department review comments for the above-referenced project. The responses from PACE are as follows:

a. **Comment:** Chapter 2.1 Pollutants of Concern/water Quality and Pollutants of Concern: Second paragraph – How is the algae bloom controlled in the lakes in case of high concentrations of TP, TN, and BOD. Are these factors taken into account in the water quality monitoring?

**PACE Response:** Algal blooms will occur occasionally in any urban lake. The water quality systems proposed for Mariposa Lakes is designed to continually treat the water in the lakes with the goal of reducing the frequency and severity of algal blooms. However, blooms will occur. These are dealt with by the lake management company. Treatments include physical removal of excess algae, treatment with algacides by licensed applicators, and simply letting the bloom subside, depending on the severity of the bloom.

b. **Comment:** Chapter 4.2 Water Quality Modeling/Model Input: Second paragraph – the units of Q in the rational method are cfs, as opposed to inches.

**PACE Response:** Calculations for runoff are based on the TR-55 SCS runoff curve number method and the text has been updated to reflect this comment.
c. **Comment:** Correct reference to Little Johns Creek, as opposed to Littlejohns Creek.

**PACE Response:** The text has been updated to reflect this comment.

d. **Comment:** The proposed use of a network of man-made lakes and wet ponds as stormwater treatment controls are consistent, in concept, with the requirements of the City’s and County’s Stormwater Quality Control criteria Plan (SWQCP).

**PACE Response:** The text has been updated to reflect this comment.

e. **Comment:** The submitted report, while providing useful information about the performance of the system, does not constitute a Project Stormwater Quality Plan as required under the SWQCCP. To comply with the requirements of the SWQCCP the project proponent must submit a Project Stormwater Quality Control Plan that conforms to the content and format specified in Appendix D-1 of the SWQCCP. In particular, the Project Stormwater Quality Control Plan should document compliance with design criteria for Wet Pond treatment controls (T-4) specified in the SWQCCP, including:

- **Stormwater Quality Design Volume (SQDV)** for wet ponds for each pond and its tributary area. The SQDV is determined using Figure 5-1 based on the percent imperviousness of the tributary area and a 12-hour drawdown period for wet ponds.
- **Outlet control works designed to release the SQDV over a 12-hours drawdown period.**

**PACE Response:** This report is intended to document the water quality performance of the lakes for purposes of evaluating the environmental impacts of the project. The Project Stormwater Quality Control Plan is a more detailed report that will be produced at a later date.

If you have any questions regarding the above responses, please do not hesitate to contact us at (714) 481-7300.

Sincerely,

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

Ron Rovansek, P.E.
Project Manager

BMP/as

P:\8013E\5-Administrative\Letters\Out\Wade, David 07-18-06.doc

cc: Lynn Sutton, CGKL Kamilos Development, Inc.
    Charlie Simpson, InSite Environmental, Inc.
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1 Introduction

1.1 Executive Summary

Mariposa Lakes is a 3800-acre project located near the City of Stockton in San Joaquin County, California, just east of Highway 99 (Exhibit 1). The project site is bounded by Mariposa Road on the west and south, US Route 4 on the north, and Kaiser Road on the east. Three creeks run east to west through the project site: Duck Creek, Branch Creek, and North Little Johns Creek. These creeks will receive any stormwater runoff from the site after the runoff is treated within wet detention basins and lakes that serve as the permanent treatment Best Management Practices (BMPs) for the site.

Mariposa Lakes will be designed to provide stormwater runoff treatment as good as or better than the treatment possible with conventional stormwater BMPs. Manmade lakes will be the primary drainage and water quality treatment facility for the residential areas and wet pond detention basins will provide treatment for the industrial areas. Within the residential areas, stormwater runoff will be collected by standard buried storm drains and conveyed to the lakes. The lakes will function as wet pond stormwater treatment BMPs with enhancements that will provide better stormwater treatment than a standard wet pond. Dry weather flows will be captured by the lakes and will offset the need for makeup water, eliminating dry weather flows and the discharge of pollutants associated with dry weather flows. Industrial areas will drain toward wet pond detention basin BMPs. These basins will capture all runoff and slowly release it after adequate detention time, providing water quality treatment by settling of particulates, conversion of nutrients and pollutants, and other physical, chemical, and biological processes.

The proposed use of a network of manmade lakes and wet ponds as stormwater treatment controls is consistent, in concept, with the requirements of the City’s and County’s Stormwater Quality Control Criteria Plan (SWQCCP). The City of Stockton’s SWQCP describes the stormwater control measures that are necessary for the proposed Mariposa Lakes development and calls for a Project Stormwater Quality Control Plan (PSWQCP) for the project. The PSWQCP will describe all permanent stormwater BMPs proposed for the project, including the lakes and detention basins that will serve as the treatment control BMPs for the project. The PSWQCP will be reviewed and approved by the City prior to final City approvals of the project. The project will also have a Stormwater Pollution Prevention Plan (SWPPP) that will describe stormwater pollution prevention measures to be employed during the construction phase of the project. Both the PSWQCP and SWPPP will conform to applicable City, County, and State regulations.

This report presents a model that estimates the stormwater runoff and non-point source pollutant loads from the proposed project and compares them to the corresponding values from both existing conditions and from alternative development schemes. Based on the average annual rainfall for the site, the model predicts the total volume of runoff that will be produced in a year of average rainfall. Similarly, the average concentration (mg/l) and total annual load (lbs) of several pollutants typical of urban runoff are estimated.
Changes in runoff volume and nonpoint source pollutants discharged from the Mariposa Lakes site are predicted using a simple runoff/pollutant load model of existing conditions and the proposed development plans. The annual volume of runoff is calculated based on the average annual rainfall and a single factor, the runoff curve number, which represents the percentage of rainfall that will become runoff for each type of land use. The rainfall depth multiplied by the runoff curve number yields a runoff depth. Runoff depth multiplied by land area yields the annual volume of runoff. The pollutant concentration in the runoff is represented by the average concentration measured in runoff from similar land uses. The annual pollutant load is then calculated by multiplying the annual volume of runoff times the concentration of each pollutant. This calculation is performed for both existing and proposed conditions and the results compared to determine the expected change in runoff volume, pollutant concentration, and pollutant load. The efficiency of BMPs is represented by average pollutant removal efficiency measured in existing BMPs outside the project site. To calculate the concentration and load of a pollutant in an area that will be served by a BMP, the concentration of the pollutant from the proposed conditions is multiplied by the removal efficiency of the proposed BMP for the pollutant in question. This post-BMP pollutant concentration is then multiplied by the expected annual runoff volume to yield the annual pollutant load that will be discharged from the area. By calculating the runoff volume, pollutant load, and pollutant concentration from each subarea within the specific plan area, a complete summation of the runoff and non-point source pollutant concentrations and loads from the project is obtained for existing conditions, proposed conditions before BMP treatment, and proposed conditions with BMP treatment. These values can then be compared to evaluate the impacts of the project on runoff and pollutant discharges.

The calculations prepared for this study are not used to design infrastructure, assess flooding potential, or to evaluate changes in runoff discharge rates from the project site. These calculations do not include any calculation of changes in runoff rate (typically expressed as cubic feet of water per second (CFS) flowing downstream), and should not be confused with the calculations prepared to evaluate or design pipes, culverts, or natural channels. The runoff curve numbers used in this report are intended to represent annual average conditions, and therefore may not be the same as curve numbers or rational method coefficients used to predict flows from design storms (e.g. 100-year flood).

The model indicates that the proposed Mariposa Lakes project will produce smaller loads and lower concentrations of pollutants than alternative developments or existing agricultural land use. In other words, the project will release water of higher quality than that the existing agricultural land use currently releases. At the same time, the project will release approximately 10% more runoff on an annual basis than the existing land use, because the conversion from agricultural land to mixed urban land uses will increase the extent of impervious surfaces on the site and therefore increase the volume of runoff produced.

The hydrologic modeling here does not evaluate water levels or flow rates in receiving waters, nor indicate that the project will exacerbate any existing flooding problems that may exist downstream of the project site. The models presented here are based on average annual runoff and do not simulate peak discharge rates (measured as volume per time, cubic feet per second, for
example), nor do they simulate the flood control functions of the lakes. Storm flow discharges are studied in a separate report.

1.2 Overview of Site Hydrology
The Mariposa Lakes project will result in change to the hydrology of the project site. In the existing condition, the project site is agricultural land used mostly for farmland and nut and fruit orchards. Each creek has a large offsite drainage area that contributes flow to the site. This report does not evaluate possible future changes to offsite drainage areas nor calculate the concentrations or loads of pollutants carried by offsite flows. The project does not propose to treat offsite flows. Instead, offsite flows will be conveyed by the creeks through the project site as they are under existing conditions.

Post-development, Mariposa Lakes will consist of the same three watersheds, Duck Creek, Branch Creek, and North Little Johns Creek, but the onsite acreage draining to each creek will be altered by development. In the proposed condition, the project site will include a mix of industrial land, residential land, commercial land, and open space (Exhibit 2). There will be a total of 11 lakes of approximately 175 acres combined (Exhibit 3) that will drain into the three creeks. The Duck Creek watershed will include the industrial areas, all but one detention basin, a recharge basin, four lakes, and surrounding residential areas. The Branch Creek watershed will include five of the remaining lakes and surrounding residential areas. The remaining lakes and all portions of the project site south of North Little Johns Creek will drain into North Little Johns Creek.
Pollutants of Concern

2.1 Water Quality and Pollutants of Concern

Urban development, such as the proposed Mariposa Lakes project, leads to changes in the volume of runoff and the types and quantities of pollutants carried by the stormwater. Urban areas typically discharge more runoff and pollutants than undisturbed natural areas. However, agricultural lands generally discharge more runoff and non-point source pollutants than natural areas. Thus, the net change in runoff and non-point source pollutants that will result from this development is unclear and must be determined through careful modeling, such as the efforts described in this report.

The pollutants of concern are the non-point source pollutants that are typically associated with urban runoff, and include nutrients (total nitrogen (TN) and total phosphorus (TP)), total suspended solids (TSS), biological oxygen demand (BOD), bacteria (total coliform), total petroleum hydrocarbons (TPH), and oil and grease. Although nutrients are necessary for proper growth and development of aquatic vegetation, excessive amounts lead to over-stimulated growth of algae, altered pH and temperature, and death of aquatic life. Suspended solids and biological oxygen demand are monitored as an indicator of waste contaminants and organic matter in the water. Fecal coliform measured in water is not directly harmful to beneficial uses. However, it is used as an indicator for other pathogenic organisms that may be present.
3 Site Hydrology

3.1 Existing Hydrology and Drainage Facilities
The Mariposa Lakes project site is currently used for agriculture and its hydrology and drainage facilities are typical of agricultural areas. Runoff from the site is collected in typical agricultural ditches which discharge to the existing channels, Duck Creek, Branch Creek, and North Little Johns Creek. Surface slopes at the project site are moderate. In general, the runoff from the site is typical of orchard agricultural land use.

3.2 Proposed Hydrology and Drainage Facilities
Residential areas of the proposed project will be designed to drain through a system of centrally-located lakes. All surface runoff will be collected in standard urban drainage facilities. Runoff will then be delivered to specially-designed BMPs located within the edges of the lakes that will pre-treat all runoff before the runoff enters the lakes. Once in the lakes, water will be continually treated by a system of underwater bio-filters, constructed wetlands, and aeration. This system is designed to maintain the highest possible level of water quality in the lakes for the sake of both the environment and the aesthetics of the lakes. The system that will be designed for the Mariposa Lakes is based on systems that have successfully operated in similar manmade residential lakes for many years, maintaining excellent water quality despite inflows of nuisance flow, urban runoff, and other nutrient-laden waters.

The Mariposa Lakes will be built with enough reserve storage capacity to eliminate all dry-weather discharges. Therefore, dry weather flows will never leave the site, but instead, will be captured and retained within the lakes. In rainfall events, excess water will be temporarily detained then discharged downstream through lake outlet facilities. Prior to discharge the water will receive a high level of water quality treatment and will carry significantly reduced loads of pollutants as compared to typical urban runoff. During typical small rain events, as runoff enters the lakes, lake water will be discharges and much of the runoff will be retained in the lake. The lake water is typically much cleaner than stormwater runoff, thus the discharge from the lake system is much cleaner than the runoff from a typical stormwater treatment BMP or from an urban area without BMPS. The Mariposa Lakes will be designed to significantly improve the quality of runoff from the site. Surface flows from the Mariposa Lakes site will discharge to Duck Creek, Branch Creek, and North Little Johns Creek that cross the project site.

Industrial portions of the site will drain to wet pond detention basins, which will detain runoff and provide removal of pollutants from the runoff. Runoff will then be discharged to the creeks. These wet ponds will be designed to provide high quality treatment of runoff and meet current design standards.
4 Water Quality Modeling

A water quality model of Mariposa Lakes has been prepared to estimate the discharges of pollutants from the project site and quantify the changes in runoff volume and non-point source pollutant loadings that will result from development of Mariposa Lakes.

4.1 Model Overview

The model presented in this report simulates the runoff from the project site in four steps. The first step simulates runoff water quality based on runoff volumes for the watershed and typical concentrations of water quality constituents associated with proposed land uses. The second step simulates the effect of mixing site runoff with lake water. The third step simulates the removal of constituents by in-lake processes. The fourth step presents the volume and quality of runoff that is discharged from the site.

This process is applied to three project site conditions: Existing Conditions, Alternative Proposed Design, and Proposed PACE Design. The existing conditions model simulates runoff from the existing agricultural land use, and does not include any BMPs to treat runoff. The alternative proposed design model includes the proposed land uses but none of the BMP treatments, which are wet pond detention basins in the industrial region as well as lakes in the residential region. The proposed PACE design model includes the proposed land uses as well as the BMP treatments. The existing conditions model provides a baseline that is useful as a comparison to the proposed project. The alternative proposed design model quantifies the volume of runoff and loads of pollutants that will be generated within the proposed project site. This volume and load of pollutants would be discharged from a project site without BMPs, thus the alternative proposed design results are useful in gauging the effectiveness of proposed stormwater quality BMPs in mitigating the impacts of development. In addition to presenting the effects of proposed land uses, the proposed PACE design model also presents the impacts of lakes as treatment facilities on the effects of developing on the site. This allows for an analysis of how the proposed project will influence runoff volume and non-point source pollutant loading from the site.

The project site was separated into four regions for modeling purposes. It was first divided based on proposed watershed design, resulting in the Duck Creek watershed, Branch Creek watershed, and North Little Johns Creek watershed. Duck Creek watershed was further separated based on the location of lakes. The industrial areas contain no lakes but have detention basins. This affects the BMP treatment that the runoff will receive. Therefore, all industrial land and surrounding areas that will drain into detention basins are grouped into one subarea of Duck Creek watershed. The remaining areas of Duck watershed, which are predominantly residential, will drain into lakes only and are grouped into another subarea of Duck Creek watershed. Based on these factors, water quality was modeled for four subareas (Exhibit 4): North Little Johns Creek, Branch Creek, Duck Creek A (industrial/basin region), and Duck Creek B (residential/lake region). However, final discharged values will be presented for Duck Creek watershed as a whole, Branch Creek, and North Little Johns Creek.
4.2 Model Input

Several types of input data are used in the model including estimates of runoff volume, measured typical runoff pollutant concentrations, lake water quality measured in a manmade lake similar to the proposed Mariposa Lakes, lake design values, and typical BMP treatment efficiencies.

Rainfall predictions are based on publicly available rainfall measurements for the area, as presented in Exhibit 5. Runoff estimates are based on project acreage, soil types, and existing and proposed land uses. The SCS runoff curve number method is used to predict runoff depth, which is converted into runoff volume based on watershed area. This method is among the most widely used and accepted standard methods in hydrology. The SCS method equation is

\[
Q = \frac{(P - I_a)^2}{(P - I_a) + S}
\]

where \( Q \) is runoff in inches, \( P \) is rainfall in inches, \( I_a \) is initial abstraction in inches, and \( S \) is potential maximum retention after runoff begins in inches. Initial abstraction represents all losses before runoff begins and is approximated by

\[
I_a = 0.2S
\]

Potential maximum retention after runoff begins, \( S \), is correlated to soil and cover conditions through the dimensionless curve number, \( CN \), by

\[
S = \frac{1000}{CN} - 10
\]

Curve numbers are selected based on land use and soil type as listed in TR-55 (Appendix B). The project site consists predominantly of soil type D with minimal amount of soil type C. The curve number selected for Mariposa Lakes in its existing condition assumes fair conditions for orchard wood-grass combination cover type. In selecting curve numbers for the proposed land uses, fair condition is assumed in all cases. Institutions, which include religious facilities, library, and fire houses, are categorized as commercial-business land use while schools are classified as a combination of commercial and open space land use. High, medium, and low density residential curve numbers assumed values for 1/8, 1/4, and ½ acre lot sizes respectively. Village estates assumed 1 acre lot sizes and existing residential area assumed ¼ acre lot sizes, similar to medium density residential area. When more than one land use exists for the watershed, an area-weighted runoff coefficient is necessary. The equation for weighted runoff coefficient is

\[
CN_{\text{weighted}} = \frac{\sum (CN_i \times Area_i)}{\sum Area_i}
\]

Weighted curve numbers and results for runoff depth for the four subareas based on the SCS method are shown in Table 4.2.1.
Table 4.2.1 Runoff Depth

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Average Annual Precipitation (in)</th>
<th>Pre-development Runoff Depth (in)</th>
<th>Runoff Coefficient</th>
<th>Post-development Runoff Depth (in)</th>
<th>Runoff Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duck A</td>
<td>13</td>
<td>82</td>
<td>10.7</td>
<td>91.5</td>
<td>11.9</td>
</tr>
<tr>
<td>Duck B</td>
<td>13</td>
<td>82</td>
<td>10.7</td>
<td>87.5</td>
<td>11.4</td>
</tr>
<tr>
<td>Branch</td>
<td>13</td>
<td>82</td>
<td>10.7</td>
<td>87.5</td>
<td>11.4</td>
</tr>
<tr>
<td>NLJ</td>
<td>13</td>
<td>82</td>
<td>10.7</td>
<td>87.4</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Runoff pollutant concentrations are represented as Event Mean Concentration (EMC) data and are area-weighted by acreage and land use. Quantitative stormwater monitoring data is not available for Central California, therefore, data collected by the Los Angeles County and Ventura County NPDES Stormwater Monitoring Programs have been used in the model included in this report. LA County data was selected because LA County has extensively monitored its stormwater and made available the resulting data (Table 4.2.2, Appendix C). The project site as it exists today is modeled as agricultural land use, while the proposed site is modeled for the various proposed land uses. Los Angeles County does not provide data for agricultural land use. Therefore, data from Ventura County Stormwater Monitoring Program for agricultural land use is applied in the model for the existing condition (see Table 4.2.2, Appendix D).

Table 4.2.2 Pollutant Concentration in Runoff reported by Land Use

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Runoff TP (mg/l)</th>
<th>Runoff TN ³ (mg/l)</th>
<th>Runoff TSS (mg/l)</th>
<th>Runoff BOD (mg/l)</th>
<th>Runoff Total Coliform (MPN/100ml)</th>
<th>Runoff Oil/Grease (mg/l)</th>
<th>Runoff TPH (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duck A ¹</td>
<td>0.33</td>
<td>3.4</td>
<td>159</td>
<td>19</td>
<td>4.4E+05</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Duck B ¹</td>
<td>0.28</td>
<td>3.2</td>
<td>83</td>
<td>17</td>
<td>1.1E+06</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Branch ¹</td>
<td>0.27</td>
<td>3.2</td>
<td>87</td>
<td>17</td>
<td>1.0E+06</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>NLJ ¹</td>
<td>0.27</td>
<td>3.2</td>
<td>97</td>
<td>17</td>
<td>9.3E+05</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Agricultural ²</td>
<td>132</td>
<td>27</td>
<td>428</td>
<td>5.3</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.20</td>
</tr>
</tbody>
</table>

¹ - Area-weighted runoff mean concentrations based on data reported by LA County Stormwater Monitoring Report by land use
² - Runoff mean concentrations as reported by Ventura County Stormwater Monitoring Report for agricultural land
³ - N is the sum of Nitrate-N, Nitrite-N, and TKN

Several project design values are used in estimating pollutant discharge. These values include acreages of various land uses (Exhibit 2) and lake water volume, and are based on land use plans for the project. The anticipated water quality in the lakes before a storm event is based on several years of monthly monitoring data collected at Bridgeport Lake in Santa Clarita, California. Bridgeport Lake incorporates the same water quality systems as Mariposa Lakes does and has been reliably monitored for an extended period of time (Table 4.2.3). However, not all of the constituents being modeled in this report have been monitored in Bridgeport Lake.
The treatment efficiency of the lakes is modeled based on average efficiency of wet ponds throughout the United States (Table 4.2.4, Appendix E). Although runoff in the industrial region will not drain into a lake, it still drains into wet pond detention basin. Due to water quality systems, the lakes will have significantly improved treatment capability compared to standard wet ponds, however, they are modeled as standard wet ponds to provide a conservative estimate of pollutant discharges.

### Table 4.2.3 Pollutant Concentration within Lake

<table>
<thead>
<tr>
<th>Lake</th>
<th>TP (mg/l)</th>
<th>TN (mg/l)</th>
<th>TSS (mg/l)</th>
<th>BOD (mg/l)</th>
<th>Total Coliform (MPN/100ml)</th>
<th>Oil/Grease (mg/l)</th>
<th>TPH (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake 1</td>
<td>0.1</td>
<td>1.5</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1 - Lake concentrations of Total P and Total N based on monitoring data for Bridgeport Lake, 2002-2005
2 - Lake concentrations of Total N include only NO₃. Total N data are not available.

### Table 4.2.4 BMP Averaged Efficiency

<table>
<thead>
<tr>
<th>BMP</th>
<th>TSS</th>
<th>TP</th>
<th>TN</th>
<th>Bacteria</th>
<th>O/G</th>
<th>BOD</th>
<th>TPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Pond</td>
<td>78</td>
<td>55</td>
<td>35</td>
<td>82</td>
<td>66</td>
<td>47</td>
<td>57</td>
</tr>
</tbody>
</table>

4.3 Model Calculations

The calculations used in the water quality model are described in four steps. The four steps described are all found in the model titled “Proposed Conditions with PACE Lake.” Other versions of the model used to predict runoff from existing condition or proposed conditions with alternative stormwater management scenarios may not include all four steps.

Step 1 calculates the volume of runoff generated by the project site and the expected concentrations and loads of pollutants for each design storm. The first column, runoff depth, is based on calculations prepared by PACE following the SCS runoff curve number method. The next column, runoff volume, is runoff depth multiplied by watershed area. The remaining columns are total pollutant loads in runoff for the various constituents. These values are calculated by multiplying the runoff volume by the EMC, presented in Table 4.2.2, and the conversion factor to produce load in the unit of pounds.

Step 2 simulates the effect of mixing urban runoff from the site with lake water, which is generally less polluted than the runoff. This step assumes complete mixing of runoff and lake water, which is reasonable because runoff will be released into the lake from multiple entry points spread around the lake perimeter. The lake will also include aeration and pumping equipment to provide constant mixing of water within the lake. The first column contains lake volume in acre-feet. This volume is based on proposed lake area (Exhibit 4) and an average depth of seven feet. The remaining columns are the diluted pollutant concentrations after mixing with the lake water. These values are calculated by first summing the pollutant load produced from runoff and from lake water and then dividing the total load by the sum of lake and runoff volume. In the cases where lake water quality data is not available, values of zero are assumed. The
Existing Condition and Alternative Design model do not include this step because they do not contain any available lakes to dilute.

Step 3 simulates the removal of constituents expected in a standard wet pond or dry extended detention basin BMP. Although the Mariposa Lakes will include water quality enhancements that are expected to significantly improve the pollutant removal efficiency of the lake as compared to a standard wet pond, the impact of these enhancements is not simulated in step 3. This is because qualitative values of the treatment efficiency of the lake are not available, whereas a large body of data on wet pond removal efficiency is available. The columns reporting treated concentration are calculated by multiplying the diluted concentration from step 2 by (1-efficiency). Step 3 is not included in the Existing Condition and Alternative Design models because there are no detention basins or lakes in either model.

Step 4 calculates the loads of pollutants that will be discharged. The first column, volume of water discharged, is the volume of runoff that is produced for the watershed. This number is presented in step 1 also. The remaining columns show pollutant load for each constituent and is calculated by multiplying the treated concentration from step 3 by the volume of water discharged and the conversion factor to result in pollutant load in pounds. In the existing and alternative proposed models where step 3 is not included, the discharged load are calculated by multiplying the discharged volume of water by the runoff concentrations provided in Table 4.2.2. These loads are the quantities of pollutants that are discharged from the project site and can be used to compare one proposed scenario with another or to compare the proposed project condition with the existing condition.

4.4 Model Results and Discussion

Modeling of Duck watershed, which comprises 2300 acres, shows that the volume of water discharged from the site increases from existing to proposed conditions by 10%, approximately 200 ac-ft.

Loads produced in the proposed PACE design for all constituents except BOD and TPH show a decrease from the load produced in the existing condition. Loads for total phosphorus, nitrogen, suspended solids, and coliform show a minimum decrease of 92%, while loads for oil and grease show a decrease of 52%. BOD and TPH loads increase for both the alternative proposed design as well as the proposed PACE design. The increase that results from the proposed PACE design is less than half of the increase that results from the alternative proposed design. For all constituents, loads from the proposed PACE design show a minimum difference of 40% from loads from the alternative proposed design.

A similar trend results with the concentrations produced by the three conditions. Total phosphorous, nitrogen, suspended solids, and coliform concentrations resulting from the proposed PACE design show a minimum decrease of 93%, while oil and grease concentrations show a decrease of 56% from existing condition concentrations. Again, there is an increase in concentration for BOD and TPH. Due to the low existing BOD and TPH concentrations, calculations show a significant increase in terms of percentage. However, concentrations
actually only increase by 3 mg/l and 0.4 mg/l respectively, which is again, less than half of the increase that results from the alternative proposed design, at 13 mg/l and 1.3 mg/l.

The proposed development in the 1200 acres of Branch watershed increases the amount of runoff by approximately 75 ac-ft, which is less than 10% of the runoff produced in the existing condition. Although Branch watershed shows very similar trends, Branch watershed shows slightly greater decreases in load and concentrations than Duck watershed does. Loads for total phosphorus, nitrogen, suspended solids, and coliform decrease by a minimum of 93% in the proposed PACE condition, relative to the existing condition, and oil and grease decrease by 67%. Again, BOD and TPH show an increase from the existing condition but the increase that results from the proposed PACE design is less than half of the increase that results from the alternative proposed design.

Concentrations for total phosphorous, nitrogen, suspended solids, and coliform concentrations resulting from the proposed PACE design show a minimum decrease of 94%, while oil and grease concentrations show a decrease of 70% from existing condition concentrations. Again, there is also an increase in concentration for BOD and TPH, however, concentrations only increase by 0.8 mg/l and 0.2 mg/l respectively. These increases in concentration for BOD and TPH are again less than half of the increases that result from the alternative proposed design.

North Little Johns watershed, which is approximately 300 acres, is a very small subarea of the project site (3800 acres), which produces approximately 300 ac-ft of runoff. Like Branch watershed, the amount of runoff increased by less than 10% from existing condition to the proposed PACE design. Reductions in pollutant load and concentrations in this watershed are very similar to that in both Duck and Branch watersheds. Loads for total phosphorus, nitrogen, suspended solids, and coliform show a minimum decrease of 92% in the proposed PACE design. For oil and grease, loads decrease by 57% in the proposed PACE design. BOD and TPH loads increase in both proposed designs, but less so for the proposed PACE design.

Concentrations for total phosphorous, nitrogen, suspended solids, and coliform concentrations resulting from the proposed PACE design show a minimum decrease of 93%, while oil and grease concentrations show a decrease of 60% from existing condition concentrations. BOD and TPH concentrations increase by 2.9 mg/l and 0.3 mg/l respectively.

Increases in BOD and TPH are expected with development because they are anthropogenic pollutants that commonly result from lawns, cars, people, and industrial production. In the case of Duck watershed, most of the pollutants are a result of region A where runoff does not receive dilution treatment by lakes. Region A accounts for 65% of the total Duck watershed acreage.

The summary of the calculations and results are shown in Appendix F. Tables 4.4.1 and 4.4.2 present the total loads and concentrations for the entire Mariposa Lakes project site as a whole. Due to the proposed development, the volume of water discharged increased by 9%, approximately 300 ac-ft. However, four of
the seven pollutants show a significant reduction (greater than 90%) in both load and concentration from the existing condition. One pollutant, oil and grease, shows a lesser but still significant reduction in load and concentration at 57% and 61% respectively. BOD and TPH show increases in both load and concentration from the existing condition to the proposed PACE design. However, this increase is considerably less than the increase that arises from the alternative proposed design. Also, the actual increase in concentration for BOD and TPH are only 3 mg/l and 0.3 mg/l respectively. In general, the proposed PACE design shows greater reductions in pollutant loads and concentrations than the alternative proposed design does. In addition, the alternative proposed design results in reductions of fewer pollutants than does the proposed PACE design. The model shows that Mariposa Lakes will generally discharge lower concentrations (mg/l) and loads (lbs) of pollutants than both the alternative development and the existing agricultural land use.

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<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
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1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease

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1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease
5 Conclusion

The models presented in this report demonstrate that the Mariposa Lakes project will result in smaller loads (lbs per year) and concentrations (mg/l) for most of the pollutants typically found in urban runoff. The existing land use is agriculture, which tends to produce significant loads of sediment, nutrients, and some other pollutants. The proposed urban land uses will also produce many of the same pollutants, but the proposed lakes and detention basins will significantly reduce the loads and concentrations of these pollutants before runoff is discharged from the site. The development of the site will increase the average annual volume of stormwater runoff by approximately 10%. This report does not attempt to address the impacts of the project on flooding and peak discharges downstream.

The model examines discharges from three watersheds of approximately 2300, 1200 and 300 acres in the project site that will drain toward 11 lakes and a number of detention basins. Duck watershed results in the greatest amount of discharge due to its larger acreage. Trends in load and concentration change for each constituent is similar for all three watersheds. Generally, there is a significant decrease in load and concentration for phosphorus, nitrogen, suspended solids, and coliform and a less significant decrease for oil and grease. BOD and TPH increase for each watershed due to their anthropogenic nature and dramatic change in land use. Although other pollutants are anthropogenic as well, the increase is more dramatic for these two constituents due to the existing land use (agricultural) which produces very slight amounts of TPH and milder amounts of BOD. TPH increase is an expected result of developing industrial areas and introduction of machinery, automobiles, and other contributors due to population increases. BOD increase is likely a result of the residential areas arising from development. This increases the amount of parks, lawns, and open space that result in grass clippings, leaves, and lawn fertilizer. In addition, the addition of residential area may also lead to paper and food wastes not expected in an agricultural setting. The net impact of the proposed PACE design is a general reduction of pollutant loads and concentrations ranging from 50% to near 100%.

In conclusion, the water quality model presented here demonstrates that Mariposa Lakes will discharge significantly smaller loads and concentrations of pollutants than alternate development schemes or existing agricultural land use. Mariposa Lakes represent the best available water treatment technology for residential development and the project will serve as a model for water quality sensitive development in the region.
6 References


Los Angeles County Department of Public Works. 2000. Los Angeles County Stormwater Quality Monitoring Data. Los Angeles, California.


Mariposa Lakes Project Location

Branch Creek Watershed

Duck Creek Watershed

Littlejohns Creek Watershed

Hydrography
Mariposa Lakes
Stockton, California
Land Use Plan

Land Use Legend

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July 5, 2006

LAND PLANNER / LANDSCAPE ARCHITECT:

EXHIBIT 2
Legend
- Lakes
- Wet Pond Detention Basins
- Project Boundary

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1,500 0 1,500 3,000 Feet
Rainfall Zone Boundary
Hydrography

Sub-Basins
Area Weighted Sub-Basin Rainfall Value

Mariposa Lakes Project Location

13'/Yr (3.36' - 100 Yr/24 Hr)
14'/Yr (3.36' - 100 Yr/24 Hr)
18'/Yr (3.93' - 100 Yr/24 Hr)
22.5'/Yr (4.57' - 100 Yr/24 Hr)
27.5'/Yr (5.27' - 100 Yr/24 Hr)
Appendix A

San Joaquin County
East Stockton
Soil Survey Soil Map & Table 19
**TABLE 19.--WATER FEATURES**

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

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* See description of the map unit for composition and behavior characteristics of the map unit.
Appendix B

TR-55
Tables 2.2a, 2.2c
Figure 2-3
### Table 2-2a Runoff curve numbers for urban areas

<table>
<thead>
<tr>
<th>Cover description</th>
<th>Average percent impervious area</th>
<th>Curve numbers for hydrologic soil group</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>B</td>
</tr>
</tbody>
</table>

#### Fully developed urban areas (vegetation established)

- **Open space (lawns, parks, golf courses, cemeteries, etc.)**: 68 79 86 89
  - Poor condition (grass cover < 50%) 68
  - Fair condition (grass cover 50% to 75%) 49
  - Good condition (grass cover > 75%) 39

- **Impervious areas**
  - Paved parking lots, roofs, driveways, etc. (excluding right-of-way) 98
  - Streets and roads:
    - Paved; curbs and storm sewers (excluding right-of-way) 98
    - Paved; open ditches (including right-of-way) 83
    - Gravel (including right-of-way) 76
    - Dirt (including right-of-way) 72

- **Western desert urban areas**
  - Natural desert landscaping (pervious areas only) 63 77 85 88
  - Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders) 96 96 96 96

#### Urban districts:

- Commercial and business 85 89 92 94 95
- Industrial 72 81 88 91 93

#### Residential districts by average lot size:

- 1/8 acre or less (town houses) 65 77 85 90 92
- 1/4 acre 38 61 75 83 87
- 1/3 acre 30 57 72 81 86
- 1/2 acre 25 54 70 80 85
- 1 acre 20 51 68 79 84
- 2 acres 12 46 65 77 82

#### Developing urban areas

- Newly graded areas (pervious areas only, no vegetation) 77 86 91 94
  - Idle lands (CN's are determined using cover types similar to those in table 2-2c).

---

1. Average runoff condition, and \( I_a = 0.2 \).
2. The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
3. CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
4. Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
5. Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.
<table>
<thead>
<tr>
<th>Cover description</th>
<th>Hydrologic condition</th>
<th>Curve numbers for hydrologic soil group</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>A</td>
</tr>
</tbody>
</table>
| Pasture, grassland, or range—continuous forage for grazing.  
|                   | Poor                 | 68| 79| 86| 89|
|                   | Fair                 | 49| 69| 79| 84|
|                   | Good                 | 39| 61| 74| 80|
| Meadow—continuous grass, protected from grazing and generally mowed for hay. | — | 30| 58| 71| 78|
| Brush—brush-weed-grass mixture with brush the major element.  
|                   | Poor                 | 48| 67| 77| 83|
|                   | Fair                 | 35| 56| 70| 77|
|                   | Good                 | 30 | 48| 65| 73|
| Woods—grass combination (orchard or tree farm).  
|                   | Poor                 | 57| 73| 82| 86|
|                   | Fair                 | 43| 65| 76| 82|
|                   | Good                 | 32 | 58| 72| 79|
| Woods.  
|                   | Poor                 | 45| 66| 77| 83|
|                   | Fair                 | 36| 60| 73| 79|
|                   | Good                 | 30 | 55| 70| 77|
| Farmsteads—buildings, lanes, driveways, and surrounding lots. | — | 59| 74| 82| 86|

1 Average runoff condition, and $I_s = 0.26$.
2 Poor: <50% ground cover or heavily grazed with no mulch.
   Fair: 50 to 75% ground cover and not heavily grazed.
   Good: >75% ground cover and lightly or only occasionally grazed.
3 Poor: <50% ground cover.
   Fair: 50 to 75% ground cover.
   Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN’s shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN’s for woods and pasture.
6 Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
   Fair: Woods are grazed but not burned, and some forest litter covers the soil.
   Good: Woods are protected from grazing, and litter and brush adequately cover the soil.
Appendix C

Los Angeles County
Stormwater Monitoring Data
(Excerpt)
Los Angeles County Department of Public Works
Stormwater Quality Monitoring Data

Complete data available at http://ladpw.org/wmd/npdes/wq_data.cfm
### Table 4-12. Summary of 1994-2000 Land Use Results by Site

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<th>Vacant</th>
<th>High Density Single Family Residential</th>
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<td>No. of Non-Detects</td>
<td>No. of Detects</td>
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<td>No. of Non-Detects</td>
<td>No. of Detects</td>
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<tr>
<td>CO2</td>
<td>94 1 mg/l</td>
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<td>94 20 MNP/100ml</td>
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<td>100 528,750 90,000 1.35</td>
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<tr>
<td>Total Coliform/Total Coliform</td>
<td>94 0 S.I.D.</td>
<td>7 0</td>
<td>100 51,000 500 0.82</td>
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<tr>
<td>Total Enterokinocuss</td>
<td>94 20 MNP/100ml</td>
<td>8 0</td>
<td>100 68,560 150,000 0.36</td>
</tr>
<tr>
<td>General Minerals</td>
<td>94 0.1 mg/l</td>
<td>37 7</td>
<td>97 126 0.30 2.11</td>
</tr>
<tr>
<td>Anamnia</td>
<td>94 0.1 mg/l</td>
<td>37 7</td>
<td>97 126 0.30 2.11</td>
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<td>Calcium</td>
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<td>37 7</td>
<td>97 126 0.30 2.11</td>
</tr>
<tr>
<td>Magnesium</td>
<td>94 0.1 mg/l</td>
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<td>97 126 0.30 2.11</td>
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<tr>
<td>Sodium</td>
<td>94 0.1 mg/l</td>
<td>37 7</td>
<td>97 126 0.30 2.11</td>
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**Continued...**
## Table 4-12. Summary of 1994-2000 Land Use Results by Site

<table>
<thead>
<tr>
<th>Data Included</th>
<th>DL</th>
<th>Units</th>
<th>No. of Samples</th>
<th>No. of Non-Detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
<th>No. of Samples</th>
<th>No. of Non-Detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
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<tbody>
<tr>
<td><strong>Total Copper</strong></td>
<td>97</td>
<td>mg/l</td>
<td>24</td>
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<td>100</td>
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<td><strong>Discharged Iron</strong></td>
<td>94</td>
<td>100</td>
<td>mg/l</td>
<td>39</td>
<td>17</td>
<td>56</td>
<td>382</td>
<td>106</td>
<td>2.81</td>
<td>45</td>
<td>35</td>
<td>22</td>
<td>202</td>
<td>50</td>
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<tr>
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<td><strong>Organochlorine Pesticides</strong></td>
<td>94</td>
<td>100</td>
<td>mg/l</td>
<td>39</td>
<td>17</td>
<td>56</td>
<td>382</td>
<td>106</td>
<td>2.81</td>
<td>45</td>
<td>35</td>
<td>22</td>
<td>202</td>
<td>50</td>
</tr>
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<td><strong>Organochlorine Pesticides &amp; PCBs</strong></td>
<td>94</td>
<td>100</td>
<td>mg/l</td>
<td>39</td>
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<td>56</td>
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<td>106</td>
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<tr>
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<td>100</td>
<td>mg/l</td>
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<td>56</td>
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<td>mg/l</td>
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<td>17</td>
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<td>35</td>
<td>22</td>
<td>202</td>
<td>50</td>
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</table>

CV = Coefficient of variation  
DL = Detection Limit  
S.I.D. = Statistically Invalid Data: not enough data above detection limit collected  
a) Detection limits have changed throughout the monitoring process. Only data matching the current detection limit is displayed in this table. These included since field indicates the first year of the storm season with the current detection limit.
### Table 4-12. Summary of 1994-2000 Land Use Results by Site

<table>
<thead>
<tr>
<th>Data Included</th>
<th>Sedi.¹</th>
<th>DL Units</th>
<th>Transportation</th>
<th>Light Industrial</th>
<th>Educational</th>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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<td>Percent Detects</td>
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<td>Median</td>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
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<td>Median</td>
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#### Miscellaneous Constituents

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<th>Educational</th>
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<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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<td>No. of Samples</td>
<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td></td>
<td>No. of Samples</td>
<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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#### Indicator Bacteria

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<th>Educational</th>
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</thead>
<tbody>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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<tr>
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<td>No. of Non-detects</td>
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#### General Minerals

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<tbody>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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#### Nutrients

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<td>Percent Detects</td>
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#### Metals

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<td>Median</td>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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<tr>
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<td>No. of Non-detects</td>
<td>Percent Detects</td>
<td>Mean</td>
<td>Median</td>
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</table>

### Notes

1. Sedi. = Sediment

---

¹ For the purpose of this table, "Sedi." refers to sediment samples.
Table 4-12. Summary of 1994-2000 Land Use Results by Site

<table>
<thead>
<tr>
<th>Substance</th>
<th>Detection Limits</th>
<th>S.I.D.</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
<th>No. of Samples</th>
<th>No. of Non-detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
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<tr>
<td><strong>Transportation</strong></td>
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<tr>
<td>Total Copper</td>
<td>97 µg/l</td>
<td>S.I.D.</td>
<td>1.15</td>
<td>0.15</td>
<td>39</td>
<td>54</td>
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<td>100</td>
<td>0</td>
<td>96</td>
<td>38</td>
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<tr>
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<td>94 100 µg/l</td>
<td>S.I.D.</td>
<td>1.90</td>
<td>0.90</td>
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<td>0.74</td>
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<td>0.15</td>
<td>39</td>
<td>54</td>
<td>2</td>
<td>100</td>
<td>0</td>
<td>96</td>
<td>38</td>
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<tr>
<td>Total Lead</td>
<td>97 5 µg/l</td>
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<td>1.57</td>
<td>0.57</td>
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<td>26</td>
<td>2</td>
<td>23</td>
<td>12</td>
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<tr>
<td>Dissolved Manganese</td>
<td>98 100 µg/l</td>
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<td>27</td>
<td>2</td>
<td>26</td>
<td>2</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Total Manganese</td>
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<td>S.I.D.</td>
<td>1.12</td>
<td>0.12</td>
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<td>0.88</td>
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<tr>
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<td>0.88</td>
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<td>0.74</td>
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<td>23</td>
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<td>0.74</td>
<td>37</td>
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<td>2</td>
<td>23</td>
<td>12</td>
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<td>0.74</td>
<td>37</td>
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<td>7</td>
<td>26</td>
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<tr>
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<td>0.74</td>
<td>37</td>
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<td>7</td>
<td>26</td>
<td>2</td>
<td>23</td>
<td>12</td>
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<tr>
<td>Dissolved Thallium</td>
<td>97 5 µg/l</td>
<td>S.I.D.</td>
<td>1.74</td>
<td>0.74</td>
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<td>29</td>
<td>7</td>
<td>26</td>
<td>2</td>
<td>23</td>
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<tr>
<td>Total Thallium</td>
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<td>0.74</td>
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<tr>
<td>Dissolved Zn</td>
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<td>0.74</td>
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<td>23</td>
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</table>

**SVOCs**

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<th>Detection Limits</th>
<th>S.I.D.</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
<th>No. of Samples</th>
<th>No. of Non-detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>99 µg/l</td>
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<td>1.00</td>
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<td>0.16</td>
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<td>10</td>
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<tr>
<td>Acenaphthene</td>
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<td>0.16</td>
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<td>10</td>
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<tr>
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<td>0.16</td>
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<td>Benzo[b]fluoranthene</td>
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<td>0.16</td>
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<td>Benzo[c]chrysene</td>
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<td>0.16</td>
<td>0.16</td>
<td>37</td>
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<tr>
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<td>99 0.05 µg/l</td>
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<td>0.16</td>
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<td>Alkyl SVOCS</td>
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<td>S.I.D.</td>
<td>0.16</td>
<td>0.16</td>
<td>37</td>
<td>1</td>
<td>7</td>
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<td>Pesticides</td>
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<td>94 0.05-1.0 µg/l</td>
<td>S.I.D.</td>
<td>0.16</td>
<td>0.16</td>
<td>37</td>
<td>1</td>
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<td>0.16</td>
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<td>0.16</td>
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<td>0.16</td>
<td>37</td>
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<td>7</td>
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<td>0.16</td>
<td>37</td>
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<td>2</td>
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<td>0.16</td>
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<td>0.16</td>
<td>37</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>10</td>
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**CV** = Coefficient of variation; S.I.D. = Statistically Invalid Data, not enough data above detection limit collected; a) Detection limits have changed throughout the monitoring process. Only data matching the current detection limit is displayed in this table. The Data Included Since field indicates the first year of the storm season with the current detection limit.
## Table 4-12. Summary of 1994-2000 Land Use Results by Site

<table>
<thead>
<tr>
<th>Data Included</th>
<th>DL Units</th>
<th>No. of Samples</th>
<th>No. of Non-detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
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### Miscellaneous Constituents

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<th>No. of Samples</th>
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<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
<th>CV</th>
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<tbody>
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<td>Fecal Enterooccus</td>
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<td>S.I.D.</td>
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### General Minerals

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<th>Mean</th>
<th>Median</th>
<th>CV</th>
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### Nutrients

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<th>Median</th>
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**Source:** DL_SEASON_9400_LU.xls Page 5 of 6
Table 4-12. Summary of 1994-2000 Land Use Results by Site

<table>
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<th>Data Included</th>
<th>No. of Samples</th>
<th>No. of Non-Detects</th>
<th>Percent Detects</th>
<th>Mean</th>
<th>Median</th>
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Table 4-12. Summary of 1994-2000 Land Use Results by Site

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<td>94</td>
</tr>
<tr>
<td>Total Zinc</td>
<td>94</td>
</tr>
</tbody>
</table>

SVOCs

- Bis(2-ethylhexyl)phthalate
  - Data Included Since
  - No. of Samples: 99
  - No. of Non-detects: 1
  - Percent Detects: 6
  - Mean: 6
  - Median: 6
  - CV: 0

Pesticides

- Organochlorines & PCBs
  - Data Included Since
  - No. of Samples: 36
  - No. of Non-detects: 36
  - Percent Detects: 0
  - Mean: 36
  - Median: S.I.D.
  - CV: S.I.D.

- Carbofuran
  - Data Included Since
  - No. of Samples: 43
  - No. of Non-detects: 43
  - Percent Detects: 0
  - Mean: 43
  - Median: S.I.D.
  - CV: S.I.D.

- Glyphosate
  - Data Included Since
  - No. of Samples: 21
  - No. of Non-detects: 21
  - Percent Detects: 0
  - Mean: 21
  - Median: S.I.D.
  - CV: S.I.D.

- 2,4-D
  - Data Included Since
  - No. of Samples: 33
  - No. of Non-detects: 33
  - Percent Detects: 0
  - Mean: 33
  - Median: S.I.D.
  - CV: S.I.D.

- Bentazon
  - Data Included Since
  - No. of Samples: 96
  - No. of Non-detects: 96
  - Percent Detects: 0
  - Mean: 96
  - Median: S.I.D.
  - CV: S.I.D.
Appendix D

Ventura County
Stormwater Monitoring Data
(Excerpt)
2004-05 Annual Report

Ventura Countywide Stormwater Quality Management Program

A cooperative project of the County of Ventura, the cities of Ventura County and the Ventura County Watershed Protection District
SECTION 9.0  WATER QUALITY MONITORING

9.9.2  Monitoring Results
Land Use, Receiving Water, and Mass Emission water quality results for the 2004/05 monitoring year were generated from the collection and analysis of composite and grab samples. Results are reported as the concentrations measured from either flow-proportional or time-paced composite samples, or from single grab samples. As mentioned earlier, only samples collected from the ME-CC and ME-VR stations are collected as flow-proportional composite samples; all other composites are collected as time-paced samples. In either case, the results can be interpreted as the best available estimate of the event mean concentrations (EMC) for the given storm event.

The following constituents are collected as grab samples:

- Perchlorate
- E. Coli
- Enterococcus
- Fecal Coliform
- Total Coliform
- Conductivity
- pH
- Water Temperature
- Oil and Grease
- TRPH
- Mercury (total recoverable and dissolved)
- Ammonia Nitrogen
- MTBE (Land Use and Receiving Water sites)
- Toxicity

All other constituents are analyzed from composite samples.

9.9.3  Receiving Water and Land Use Station Results
Water quality results for the 2004/05 monitoring season from the Land Use and Receiving Water stations are presented in Table 9-40 through Table 9-55.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>R-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>10/16/04</td>
<td></td>
</tr>
<tr>
<td>Anion</td>
<td>Bromide</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.01</td>
</tr>
<tr>
<td>Anion</td>
<td>Chloride</td>
<td>n/a</td>
<td>mg/L</td>
<td>24.7</td>
</tr>
<tr>
<td>Anion</td>
<td>Perchlorate</td>
<td>n/a</td>
<td>µg/L</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Conventional</td>
<td>BOD</td>
<td>n/a</td>
<td>mg/L</td>
<td>18</td>
</tr>
<tr>
<td>Conventional</td>
<td>Conductivity</td>
<td>n/a</td>
<td>µmhos/cm</td>
<td>400</td>
</tr>
<tr>
<td>Conventional</td>
<td>Hardness as CaCO3</td>
<td>Total</td>
<td>mg/L</td>
<td>62.8</td>
</tr>
<tr>
<td>Conventional</td>
<td>pH</td>
<td>n/a</td>
<td>pH Units</td>
<td>7.7</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Dissolved Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>190</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Organic Carbon</td>
<td>n/a</td>
<td>mg/L</td>
<td>41</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Suspended Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>71</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>Oil and Grease</td>
<td>n/a</td>
<td>mg/L</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>TRPH</td>
<td>n/a</td>
<td>mg/L</td>
<td>1</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Ammonia as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.6</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrate as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.5</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrite as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.09</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Orthophosphate as P</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.39</td>
</tr>
<tr>
<td>Nutrient</td>
<td>TKN</td>
<td>n/a</td>
<td>mg/L</td>
<td>3.1</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Dissolved</td>
<td>mg/L</td>
<td>&lt; 0.016</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Total</td>
<td>mg/L</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*"<" – Constituent not detected above specified detection limit.
### SECTION 9.0 WATER QUALITY MONITORING

Table 9-41: Anion, Conventional, Hydrocarbon, and Nutrient Results from the Industrial Land Use Station I-2

<table>
<thead>
<tr>
<th>Classification</th>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>I-2 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anion</td>
<td>Bromide</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.51</td>
</tr>
<tr>
<td>Anion</td>
<td>Chloride</td>
<td>n/a</td>
<td>mg/L</td>
<td>42.8</td>
</tr>
<tr>
<td>Anion</td>
<td>Perchlorate</td>
<td>n/a</td>
<td>µg/L</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Conventional</td>
<td>BOD</td>
<td>n/a</td>
<td>mg/L</td>
<td>16</td>
</tr>
<tr>
<td>Conventional</td>
<td>Conductivity</td>
<td>n/a</td>
<td>µmhos/cm</td>
<td>800</td>
</tr>
<tr>
<td>Conventional</td>
<td>Hardness as CaCO3</td>
<td>Total</td>
<td>mg/L</td>
<td>286</td>
</tr>
<tr>
<td>Conventional</td>
<td>pH</td>
<td>n/a</td>
<td>pH Units</td>
<td>7.9</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Dissolved Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>760</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Organic Carbon</td>
<td>n/a</td>
<td>mg/L</td>
<td>40</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Suspended Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>72.5</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>Oil and Grease</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.5</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>TRPH</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.3</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Ammonia as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.8</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrate as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.9</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrite as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.11</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Orthophosphate as P</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.49</td>
</tr>
<tr>
<td>Nutrient</td>
<td>TKN</td>
<td>n/a</td>
<td>mg/L</td>
<td>2.1</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Dissolved</td>
<td>mg/L</td>
<td>&lt; 0.016</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Total</td>
<td>mg/L</td>
<td>35</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

"<" = Constituent not detected above specified detection limit.

Table 9-42: Anion, Conventional, Hydrocarbon, and Nutrient Results from the Agricultural Land Use Station A-1

<table>
<thead>
<tr>
<th>Classification</th>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>A-1 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anion</td>
<td>Bromide</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.1</td>
</tr>
<tr>
<td>Anion</td>
<td>Chloride</td>
<td>n/a</td>
<td>mg/L</td>
<td>18.3</td>
</tr>
<tr>
<td>Anion</td>
<td>Perchlorate</td>
<td>n/a</td>
<td>µg/L</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Conventional</td>
<td>BOD</td>
<td>n/a</td>
<td>mg/L</td>
<td>5.3</td>
</tr>
<tr>
<td>Conventional</td>
<td>Conductivity</td>
<td>n/a</td>
<td>µmhos/cm</td>
<td>400</td>
</tr>
<tr>
<td>Conventional</td>
<td>Hardness as CaCO3</td>
<td>Total</td>
<td>mg/L</td>
<td>292</td>
</tr>
<tr>
<td>Conventional</td>
<td>pH</td>
<td>n/a</td>
<td>pH Units</td>
<td>8.0</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Dissolved Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>860</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Organic Carbon</td>
<td>n/a</td>
<td>mg/L</td>
<td>9.4</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Suspended Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>428</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>Oil and Grease</td>
<td>n/a</td>
<td>mg/L</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>TRPH</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.2</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Ammonia as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.3</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrate as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>22.7</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrite as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.26</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Orthophosphate as P</td>
<td>n/a</td>
<td>mg/L</td>
<td>1.89</td>
</tr>
<tr>
<td>Nutrient</td>
<td>TKN</td>
<td>n/a</td>
<td>mg/L</td>
<td>4.2</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Dissolved</td>
<td>mg/L</td>
<td>9.5</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Total</td>
<td>mg/L</td>
<td>132</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

"<" = Constituent not detected above specified detection limit.
## SECTION 9.0  WATER QUALITY MONITORING

Table 9-43: Anion, Conventional, Hydrocarbon, and Nutrient Results from the Receiving Water Stations W-3 and W-4

<table>
<thead>
<tr>
<th>Classification</th>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>10/17/04</th>
<th>10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anion</td>
<td>Bromide</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.73</td>
<td>2.58</td>
</tr>
<tr>
<td>Anion</td>
<td>Chloride</td>
<td>n/a</td>
<td>mg/L</td>
<td>60.3</td>
<td>27.6</td>
</tr>
<tr>
<td>Anion</td>
<td>Perchlorate</td>
<td>n/a</td>
<td>µg/L</td>
<td>&lt; 2</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Conventional</td>
<td>BOD</td>
<td>n/a</td>
<td>mg/L</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td>Conventional</td>
<td>Conductivity</td>
<td>n/a</td>
<td>µmhos/cm</td>
<td>1100</td>
<td>500</td>
</tr>
<tr>
<td>Conventional</td>
<td>Hardness as CaCO3</td>
<td>Total</td>
<td>mg/L</td>
<td>396</td>
<td>609</td>
</tr>
<tr>
<td>Conventional</td>
<td>pH</td>
<td>n/a</td>
<td>pH Units</td>
<td>7.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Dissolved Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>930</td>
<td>1500</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Organic Carbon</td>
<td>n/a</td>
<td>mg/L</td>
<td>33</td>
<td>14</td>
</tr>
<tr>
<td>Conventional</td>
<td>Total Suspended Solids</td>
<td>n/a</td>
<td>mg/L</td>
<td>282</td>
<td>482</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>Oil and Grease</td>
<td>n/a</td>
<td>mg/L</td>
<td>&lt; 1</td>
<td>1.1</td>
</tr>
<tr>
<td>Hydrocarbon</td>
<td>TRPH</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Ammonia as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrate as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>11.4</td>
<td>23.4</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Nitrile as N</td>
<td>n/a</td>
<td>mg/L</td>
<td>0.26</td>
<td>0.09</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Orthophosphate as P</td>
<td>Total</td>
<td>mg/L</td>
<td>1.38</td>
<td>0.85</td>
</tr>
<tr>
<td>Nutrient</td>
<td>TKN</td>
<td>n/a</td>
<td>mg/L</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Dissolved</td>
<td>mg/L</td>
<td>&lt; 0.016</td>
<td>&lt; 0.016</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Total Phosphorus</td>
<td>Total</td>
<td>mg/L</td>
<td>&lt; 0.016</td>
<td>4.5</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*< – Constituent not detected above specified detection limit.
### SECTION 9.0  WATER QUALITY MONITORING

Table 9-44: Metals Results from the Residential Land Use Station R-1

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>R-1 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>Total</td>
<td>μg/L</td>
<td>1860</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Total</td>
<td>μg/L</td>
<td>2.85</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Total</td>
<td>μg/L</td>
<td>0.48</td>
</tr>
<tr>
<td>Chromium</td>
<td>Total</td>
<td>μg/L</td>
<td>6.91</td>
</tr>
<tr>
<td>Chromium VI</td>
<td>Total</td>
<td>μg/L</td>
<td>40 *</td>
</tr>
<tr>
<td>Copper</td>
<td>Total</td>
<td>μg/L</td>
<td>21.7</td>
</tr>
<tr>
<td>Lead</td>
<td>Total</td>
<td>μg/L</td>
<td>5.02</td>
</tr>
<tr>
<td>Mercury</td>
<td>Total</td>
<td>ng/L</td>
<td>12.2</td>
</tr>
<tr>
<td>Nickel</td>
<td>Total</td>
<td>μg/L</td>
<td>12.8</td>
</tr>
<tr>
<td>Selenium</td>
<td>Total</td>
<td>μg/L</td>
<td>1.48</td>
</tr>
<tr>
<td>Silver</td>
<td>Total</td>
<td>μg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Thallium</td>
<td>Total</td>
<td>μg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>Total</td>
<td>μg/L</td>
<td>126</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>81.1</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>2.07</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>0.21</td>
</tr>
<tr>
<td>Chromium</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>1.99</td>
</tr>
<tr>
<td>Copper</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>15.2</td>
</tr>
<tr>
<td>Lead</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>1.02</td>
</tr>
<tr>
<td>Mercury</td>
<td>Dissolved</td>
<td>ng/L</td>
<td>7.08</td>
</tr>
<tr>
<td>Nickel</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>9.26</td>
</tr>
<tr>
<td>Selenium</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>1.25</td>
</tr>
<tr>
<td>Silver</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Thallium</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>Dissolved</td>
<td>μg/L</td>
<td>68.1</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*<* - Constituent not detected above specified detection limit.
### SECTION 9.0 WATER QUALITY MONITORING

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>Total</td>
<td>µg/L</td>
<td>2460</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Total</td>
<td>µg/L</td>
<td>4.03</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Total</td>
<td>µg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Chromium</td>
<td>Total</td>
<td>µg/L</td>
<td>8.42</td>
</tr>
<tr>
<td>Chromium VI</td>
<td>Total</td>
<td>µg/L</td>
<td>30</td>
</tr>
<tr>
<td>Copper</td>
<td>Total</td>
<td>µg/L</td>
<td>43.5</td>
</tr>
<tr>
<td>Lead</td>
<td>Total</td>
<td>µg/L</td>
<td>6.75</td>
</tr>
<tr>
<td>Mercury</td>
<td>Total</td>
<td>ng/L</td>
<td>21.7</td>
</tr>
<tr>
<td>Nickel</td>
<td>Total</td>
<td>µg/L</td>
<td>16.8</td>
</tr>
<tr>
<td>Selenium</td>
<td>Total</td>
<td>µg/L</td>
<td>9.25</td>
</tr>
<tr>
<td>Silver</td>
<td>Total</td>
<td>µg/L</td>
<td>0.18</td>
</tr>
<tr>
<td>Thallium</td>
<td>Total</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>Total</td>
<td>µg/L</td>
<td>138</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>16.1</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>3.14</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>0.33</td>
</tr>
<tr>
<td>Chromium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>1.37</td>
</tr>
<tr>
<td>Copper</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>31.1</td>
</tr>
<tr>
<td>Lead</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Mercury</td>
<td>Dissolved</td>
<td>ng/L</td>
<td>4.71</td>
</tr>
<tr>
<td>Nickel</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>11.7</td>
</tr>
<tr>
<td>Selenium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>9.3</td>
</tr>
<tr>
<td>Silver</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Thallium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>68.8</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*"<" – Constituent not detected above specified detection limit.
### SECTION 9.0  WATER QUALITY MONITORING

**Table 9-46: Metals Results from the Agricultural Land Use Station A-1**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>A-1 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>Total</td>
<td>µg/L</td>
<td>8630</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Total</td>
<td>µg/L</td>
<td>6.45</td>
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<tr>
<td>Cadmium</td>
<td>Total</td>
<td>µg/L</td>
<td>3.09</td>
</tr>
<tr>
<td>Chromium</td>
<td>Total</td>
<td>µg/L</td>
<td>23.7</td>
</tr>
<tr>
<td>Chromium VI</td>
<td>Total</td>
<td>µg/L</td>
<td>40</td>
</tr>
<tr>
<td>Copper</td>
<td>Total</td>
<td>µg/L</td>
<td>42.1</td>
</tr>
<tr>
<td>Lead</td>
<td>Total</td>
<td>µg/L</td>
<td>10.9</td>
</tr>
<tr>
<td>Mercury</td>
<td>Total</td>
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<td>62.1</td>
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<td>Nickel</td>
<td>Total</td>
<td>µg/L</td>
<td>30.7</td>
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<td>Selenium</td>
<td>Total</td>
<td>µg/L</td>
<td>5</td>
</tr>
<tr>
<td>Silver</td>
<td>Total</td>
<td>µg/L</td>
<td>0.18</td>
</tr>
<tr>
<td>Thallium</td>
<td>Total</td>
<td>µg/L</td>
<td>0.15</td>
</tr>
<tr>
<td>Zinc</td>
<td>Total</td>
<td>µg/L</td>
<td>136</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>11.2</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>3.51</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>0.24</td>
</tr>
<tr>
<td>Chromium</td>
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<td>µg/L</td>
<td>0.88</td>
</tr>
<tr>
<td>Copper</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>7.68</td>
</tr>
<tr>
<td>Lead</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Mercury</td>
<td>Dissolved</td>
<td>ng/L</td>
<td>1.73</td>
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<tr>
<td>Nickel</td>
<td>Dissolved</td>
<td>µg/L</td>
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<tr>
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<td>Dissolved</td>
<td>µg/L</td>
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<tr>
<td>Silver</td>
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<td>µg/L</td>
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</tr>
<tr>
<td>Thallium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
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<tr>
<td>Zinc</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>4.96</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.*

< - Constituent not detected above specified detection limit.
# SECTION 9.0  WATER QUALITY MONITORING

## Table 9-47: Metals Results from the Receiving Water Stations W-3 and W-4

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Fraction</th>
<th>Units</th>
<th>W-3 2/2/04</th>
<th>W-4 2/2/04</th>
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<tbody>
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<td>10200</td>
<td>907</td>
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<td>Arsenic</td>
<td>Total</td>
<td>µg/L</td>
<td>6.1</td>
<td>7.09</td>
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<tr>
<td>Cadmium</td>
<td>Total</td>
<td>µg/L</td>
<td>0.77</td>
<td>1.24</td>
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<tr>
<td>Chromium</td>
<td>Total</td>
<td>µg/L</td>
<td>18.9</td>
<td>20.6</td>
</tr>
<tr>
<td>Chromium VI</td>
<td>Total</td>
<td>µg/L</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Copper</td>
<td>Total</td>
<td>µg/L</td>
<td>36.4</td>
<td>26.7</td>
</tr>
<tr>
<td>Lead</td>
<td>Total</td>
<td>µg/L</td>
<td>12.6</td>
<td>11.7</td>
</tr>
<tr>
<td>Mercury</td>
<td>Total</td>
<td>ng/L</td>
<td>162</td>
<td>104</td>
</tr>
<tr>
<td>Nickel</td>
<td>Total</td>
<td>µg/L</td>
<td>20.4</td>
<td>21.7</td>
</tr>
<tr>
<td>Selenium</td>
<td>Total</td>
<td>µg/L</td>
<td>40.4</td>
<td>12.2</td>
</tr>
<tr>
<td>Silver</td>
<td>Total</td>
<td>µg/L</td>
<td>&lt; 0.1</td>
<td>0.1</td>
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<tr>
<td>Thallium</td>
<td>Total</td>
<td>µg/L</td>
<td>0.17</td>
<td>0.16</td>
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<tr>
<td>Zinc</td>
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<td>µg/L</td>
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<td>Aluminum</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>15.2</td>
<td>3.75</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>3.67</td>
<td>3.54</td>
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<tr>
<td>Cadmium</td>
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<td>0.15 &lt; 0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Chromium</td>
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<td>µg/L</td>
<td>1.19</td>
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<tr>
<td>Copper</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>17.6</td>
<td>3.16</td>
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<tr>
<td>Lead</td>
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<td>µg/L</td>
<td>&lt; 0.1 &lt; 0.1</td>
<td>&lt; 0.1</td>
</tr>
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<td>Mercury</td>
<td>Dissolved</td>
<td>ng/L</td>
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<td>1.83</td>
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<tr>
<td>Nickel</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>5.07</td>
<td>4.88</td>
</tr>
<tr>
<td>Selenium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>46.3</td>
<td>11.6</td>
</tr>
<tr>
<td>Silver</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1 &lt; 0.1</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Thallium</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>&lt; 0.1 &lt; 0.1</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>Dissolved</td>
<td>µg/L</td>
<td>6.38</td>
<td>4.81</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*<* – Constituent not detected above specified detection limit.
### SECTION 9.0  WATER QUALITY MONITORING

| Classification | Method   | Constituent                  | Units | R-1     
|----------------|----------|------------------------------|-------|---------
| Organic        | EPA 625  | 1-Methylnaphthalene          | µg/L  | 0.0106  
| Organic        | EPA 625  | 1-Methylphenanthrene         | µg/L  | 0.0229  
| Organic        | EPA 625  | 2-Methylnaphthalene          | µg/L  | 0.018   
| Organic        | EPA 625  | Acenaphthene                 | µg/L  | 0.0225  
| Organic        | EPA 625  | Benzo[a]anthracene           | µg/L  | 0.0367  
| Organic        | EPA 625  | Benzo[a]pyrene               | µg/L  | 0.0397  
| Organic        | EPA 625  | Benzo[b]fluoranthene         | µg/L  | 0.0711  
| Organic        | EPA 625  | Benzo[e]pyrene               | µg/L  | 0.0599  
| Organic        | EPA 625  | Benzo(g,h,i)perylene        | µg/L  | 0.0724  
| Organic        | EPA 625  | Benzo(k)fluoranthene         | µg/L  | 0.0541  
| Organic        | EPA 625  | Bis(2-ethylhexyl)phthalate   | µg/L  | 5.14    
| Organic        | EPA 625  | Butyl benzyl phthalate       | µg/L  | 0.496   
| Organic        | EPA 625  | Chrysene                     | µg/L  | 0.113   
| Organic        | EPA 625  | Diethyl phthalate            | µg/L  | 0.361   
| Organic        | EPA 625  | Dimethyl phthalate           | µg/L  | 0.0719  
| Organic        | EPA 625  | Di-n-butylphthalate          | µg/L  | 0.293   
| Organic        | EPA 625  | Di-n-octylphthalate          | µg/L  | 0.731   
| Organic        | EPA 625  | Fluoranthene                 | µg/L  | 0.155   
| Organic        | EPA 625  | Indeno(1,2,3-cd)pyrene       | µg/L  | 0.0599  
| Organic        | EPA 625  | Naphthalene                  | µg/L  | 0.0328  
| Organic        | EPA 625  | Pentachlorophenol            | µg/L  | 0.0873  
| Organic        | EPA 625  | Perylene                     | µg/L  | 0.0227  
| Organic        | EPA 625  | Phenanthrene                 | µg/L  | 0.0815  
| Organic        | EPA 625  | Phenol                       | µg/L  | 1.15    
| Organic        | EPA 625  | Pyrene                       | µg/L  | 0.147   
| Pesticide      | EPA 625  | 4,4'-DDE                     | µg/L  | 0.0757  
| Pesticide      | EPA 625  | Diazinon                     | µg/L  | 1.06    
| Pesticide      | EPA 625  | Malathion                    | µg/L  | 1.29    

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

* - Constituent not detected above specified detection limit.
### SECTION 9.0 WATER QUALITY MONITORING

Table 9-49: Detected Trace Organic Results from the Industrial Land Use Station I-2

<table>
<thead>
<tr>
<th>Classification</th>
<th>Method</th>
<th>Constituent</th>
<th>Units</th>
<th>I-2 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>1-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0051</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>2,6-Dimethylnaphthalene</td>
<td>µg/L</td>
<td>0.0157</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>2-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0109</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Acenaphthene</td>
<td>µg/L</td>
<td>0.0102</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Anthracene</td>
<td>µg/L</td>
<td>0.0111</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(a)anthracene</td>
<td>µg/L</td>
<td>0.028</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(a)pyrene</td>
<td>µg/L</td>
<td>0.0406</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(b)fluoranthene</td>
<td>µg/L</td>
<td>0.0907</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(e)pyrene</td>
<td>µg/L</td>
<td>0.0608</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(g,h,i)perylene</td>
<td>µg/L</td>
<td>0.0442</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(k)fluoranthene</td>
<td>µg/L</td>
<td>0.0851</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>µg/L</td>
<td>13.4</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Butyl benzyl phthalate</td>
<td>µg/L</td>
<td>0.385</td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Chrysene</td>
<td>µg/L</td>
<td>0.103</td>
</tr>
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<td>Organic</td>
<td>EPA 625</td>
<td>Diethyl phthalate</td>
<td>µg/L</td>
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</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Dimethyl phthalate</td>
<td>µg/L</td>
<td>0.0815</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Di-n-butylphthalate</td>
<td>µg/L</td>
<td>0.2</td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Di-n-octylphthalate</td>
<td>µg/L</td>
<td>0.247</td>
</tr>
<tr>
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<td>EPA 625</td>
<td>Fluoranthene</td>
<td>µg/L</td>
<td>0.138</td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Indeno(1,2,3-cd)pyrene</td>
<td>µg/L</td>
<td>0.0433</td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Naphthalene</td>
<td>µg/L</td>
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</tr>
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<td>Organic</td>
<td>EPA 625</td>
<td>Perylene</td>
<td>µg/L</td>
<td>0.0182</td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Phenanthrene</td>
<td>µg/L</td>
<td>0.0439</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Pyrene</td>
<td>µg/L</td>
<td>0.111</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDE</td>
<td>µg/L</td>
<td>0.0819</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>Chlorpyrifos</td>
<td>µg/L</td>
<td>0.0168</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 547</td>
<td>Glyphosate</td>
<td>µg/L</td>
<td>R</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

<sup>*</sup>= Constituent not detected above specified detection limit.

<sup>R</sup>= Data point rejected due to irreproducibility of result caused by lab instrument calibration problems.
### SECTION 9.0  WATER QUALITY MONITORING

#### Table 9-50: Detected Trace Organic Results from the Agricultural Land Use Station A-1

<table>
<thead>
<tr>
<th>Classification</th>
<th>Method</th>
<th>Constituent</th>
<th>Units</th>
<th>A-1 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>1-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0045</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>1-Methylphenanthrene</td>
<td>µg/L</td>
<td>0.0077</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>2-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0269</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Acenaphthene</td>
<td>µg/L</td>
<td>0.0077</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(b)fluoranthene</td>
<td>µg/L</td>
<td>0.0074</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Benzo(k)fluoranthene</td>
<td>µg/L</td>
<td>0.0091</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>µg/L</td>
<td>0.249</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Butyl benzyl phthalate</td>
<td>µg/L</td>
<td>0.048 *</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Chrysene</td>
<td>µg/L</td>
<td>0.0094</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Diethyl phthalate</td>
<td>µg/L</td>
<td>0.622</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Dimethyl phthalate</td>
<td>µg/L</td>
<td>0.133</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Di-n-butylphthalate</td>
<td>µg/L</td>
<td>0.0445 *</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Fluorene</td>
<td>µg/L</td>
<td>0.0196</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Naphthalene</td>
<td>µg/L</td>
<td>0.0105</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Pentachlorophenol</td>
<td>µg/L</td>
<td>0.351</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Phenanthrene</td>
<td>µg/L</td>
<td>0.0204</td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Pyrene</td>
<td>µg/L</td>
<td>0.0172</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>2,4'-DDD</td>
<td>µg/L</td>
<td>0.0612</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>2,4'-DDE</td>
<td>µg/L</td>
<td>0.0124</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>2,4'-DDT</td>
<td>µg/L</td>
<td>0.0327</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDD</td>
<td>µg/L</td>
<td>0.0799</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDE</td>
<td>µg/L</td>
<td>0.546</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDT</td>
<td>µg/L</td>
<td>0.544</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>Chlorpyrifos</td>
<td>µg/L</td>
<td>0.0307</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>Ethoprop</td>
<td>µg/L</td>
<td>0.0507</td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 547</td>
<td>Glyphosate</td>
<td>µg/L</td>
<td>1.33</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*<sup>*</sup> – Constituent not detected above specified detection limit.
## SECTION 9.0 WATER QUALITY MONITORING

### Table 9-51: Detected Trace Organic Results from the Receiving Water Stations W-3 and W-4

<table>
<thead>
<tr>
<th>Classification</th>
<th>Method</th>
<th>Constituent</th>
<th>Units</th>
<th>W-3 10/17/04</th>
<th>W-3 10/16/04</th>
<th>W-4 10/17/04</th>
<th>W-4 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>1-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0053</td>
<td>0.0065</td>
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<td></td>
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<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>2-Methylnaphthalene</td>
<td>µg/L</td>
<td>0.0119</td>
<td>0.033</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Acenaphthene</td>
<td>µg/L</td>
<td>0.0188</td>
<td>0.0087</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>µg/L</td>
<td>0.29</td>
<td>4.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Butyl benzyl phthalate</td>
<td>µg/L</td>
<td><code>&lt; 0.005</code></td>
<td><code>0.0907</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Diethyl phthalate</td>
<td>µg/L</td>
<td>0.202</td>
<td><code>0.227</code></td>
<td><code>0.0411</code></td>
<td><code>0.1411</code></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Dimethyl phthalate</td>
<td>µg/L</td>
<td>0.041</td>
<td>0.0411</td>
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<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Di-n-butylphthalate</td>
<td>µg/L</td>
<td>0.056</td>
<td><code>0.0568</code></td>
<td><code>0.0243</code></td>
<td><code>0.0243</code></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Di-n-octylphthalate</td>
<td>µg/L</td>
<td><code>&lt; 0.005</code></td>
<td><code>0.0243</code></td>
<td><code>0.0256</code></td>
<td><code>0.0256</code></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Fluoranthene</td>
<td>µg/L</td>
<td><code>0.083</code></td>
<td><code>0.083</code></td>
<td><code>0.12</code></td>
<td><code>0.12</code></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Naphthalene</td>
<td>µg/L</td>
<td>0.012</td>
<td>0.0141</td>
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<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Phenanthrene</td>
<td>µg/L</td>
<td>0.0192</td>
<td>0.0192</td>
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<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Phenol</td>
<td>µg/L</td>
<td>0.11</td>
<td><code>&lt; 0.1</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>EPA 625</td>
<td>Pyrene</td>
<td>µg/L</td>
<td>0.009</td>
<td>0.0188</td>
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</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>2,4'-DDD</td>
<td>µg/L</td>
<td><code>&lt; 0.001</code></td>
<td><code>0.0272</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>2,4'-DDT</td>
<td>µg/L</td>
<td><code>&lt; 0.001</code></td>
<td><code>0.0161</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDD</td>
<td>µg/L</td>
<td><code>&lt; 0.001</code></td>
<td><code>0.0337</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDE</td>
<td>µg/L</td>
<td>0.128</td>
<td>0.174</td>
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<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>4,4'-DDT</td>
<td>µg/L</td>
<td>0.0615</td>
<td>0.0448</td>
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<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 625</td>
<td>Chlorpyrifos</td>
<td>µg/L</td>
<td>2.14</td>
<td>0.074</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide</td>
<td>EPA 547</td>
<td>Glyphosate</td>
<td>µg/L</td>
<td>67.5</td>
<td>17.3</td>
<td></td>
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</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

*< - Constituent not detected above specified detection limit.

### Table 9-52: Bacteriological Results from the Residential Land Use Station R-1

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Units</th>
<th>R-1 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli</td>
<td>MPN/100 mL</td>
<td>31000 *</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>MPN/100 mL</td>
<td>10000 *</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>MPN/100 mL</td>
<td>16000 *</td>
</tr>
<tr>
<td>Total Coliform</td>
<td>MPN/100 mL</td>
<td>323000 *</td>
</tr>
</tbody>
</table>

*See Appendix C for a description of the data qualifier(s) associated with this sample result.

### Table 9-53: Bacteriological Results from the Industrial Land Use Station I-2

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Units</th>
<th>I-2 10/16/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli</td>
<td>MPN/100 mL</td>
<td>288000</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>MPN/100 mL</td>
<td>10000</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>MPN/100 mL</td>
<td>50000</td>
</tr>
<tr>
<td>Total Coliform</td>
<td>MPN/100 mL</td>
<td>1935000</td>
</tr>
</tbody>
</table>

9-124
**SECTION 9.0  WATER QUALITY MONITORING**

Table 9-54: Bacteriological Results from the Agricultural Land Use Station A-1

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Units</th>
<th>A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10/16/04</td>
</tr>
<tr>
<td>E. Coli</td>
<td>MPN/100 mL</td>
<td>1000</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>MPN/100 mL</td>
<td>20000</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>MPN/100 mL</td>
<td>1100</td>
</tr>
<tr>
<td>Total Coliform</td>
<td>MPN/100 mL</td>
<td>2247000</td>
</tr>
</tbody>
</table>

Table 9-55: Bacteriological Results from the Receiving Water Stations W-3 and W-4

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Units</th>
<th>W-3</th>
<th>W-4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10/17/04</td>
<td>10/16/04</td>
</tr>
<tr>
<td>E. Coli</td>
<td>MPN/100 mL</td>
<td>52000</td>
<td>20000</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>MPN/100 mL</td>
<td>20000</td>
<td>10000</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>MPN/100 mL</td>
<td>30000</td>
<td>30000</td>
</tr>
<tr>
<td>Total Coliform</td>
<td>MPN/100 mL</td>
<td>2382000</td>
<td>583000</td>
</tr>
</tbody>
</table>
Appendix E

BMP Efficiency
Data & Sources
<table>
<thead>
<tr>
<th>Wet Pond</th>
<th>TSS</th>
<th>TP</th>
<th>TN</th>
<th>Bacteria</th>
<th>O/G</th>
<th>BOD</th>
<th>TPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67</td>
<td>48</td>
<td>31</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>45</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>51</td>
<td>33</td>
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<td>6A</td>
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<td>57</td>
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<td></td>
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</tr>
<tr>
<td>6B</td>
<td>88</td>
<td>62</td>
<td>15</td>
<td>94</td>
<td>66</td>
<td>40</td>
<td>57</td>
</tr>
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<td>7</td>
<td>85</td>
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<td>8A</td>
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<td>57</td>
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<td>55</td>
<td>35</td>
<td>82</td>
<td>66</td>
<td>47</td>
<td>57</td>
</tr>
</tbody>
</table>

No data available

1. US EPA NPDES <cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>
6. International BMP Database <www.bmpdatabase.org>
7. Austin City Connection Publication <http://www.ci.austin.tx.us/watershed/rptcontseds.htm>
8. The Practice of Watershed Publication <http://www.stormwatercenter.net/Library/Practice/74.pdf>
Appendix F

Water Quality Modeling Calculations & Summaries
Duck Watershed
Region A & Region B

Water Quality Modeling
Summary
### Discharged Pollutant Load for Average Annual Storm Event

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>2018</td>
<td>724693</td>
<td>149111</td>
<td>2349762</td>
<td>29098</td>
<td>5.6E+16</td>
<td>5490</td>
<td>1098</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>2219</td>
<td>1896</td>
<td>20204</td>
<td>798501</td>
<td>109639</td>
<td>1.9E+16</td>
<td>9034</td>
<td>8973</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>2219</td>
<td>784</td>
<td>12109</td>
<td>162503</td>
<td>50106</td>
<td>2.5E+15</td>
<td>2649</td>
<td>3325</td>
</tr>
<tr>
<td>Reduction ¹</td>
<td>-10%</td>
<td>100%</td>
<td>92%</td>
<td>93%</td>
<td>-72%</td>
<td>95%</td>
<td>52%</td>
<td>-203%</td>
</tr>
</tbody>
</table>

¹ - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease.

### Discharged Pollutant Concentration for Average Annual Storm Event

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>TP Discharged (mg/l)</th>
<th>TN Discharged (mg/l)</th>
<th>TSS Discharged (mg/l)</th>
<th>BOD Discharged (mg/l)</th>
<th>Total Coliform Discharged (MPN/100ml)</th>
<th>Oil/Grease Discharged (mg/l)</th>
<th>TPH Discharged (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>132</td>
<td>27</td>
<td>428</td>
<td>5</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>0.3</td>
<td>3.3</td>
<td>132</td>
<td>18</td>
<td>6.8E+05</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>0.1</td>
<td>2.0</td>
<td>27</td>
<td>8</td>
<td>9.2E+04</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Reduction ¹</td>
<td>100%</td>
<td>93%</td>
<td>94%</td>
<td>-57%</td>
<td>96%</td>
<td>56%</td>
<td>-175%</td>
</tr>
</tbody>
</table>

¹ - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease.
Duck Watershed
Region A – Industrial

Water Quality Modeling
Calculations & Summary
## Mariposa Lakes, Stockton, CA
### Water Quality Modeling Summary

**Duck Watershed - Region A**

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>1285</td>
<td>461447</td>
<td>94946</td>
<td>1496208</td>
<td>18528</td>
<td>3.6E+16</td>
<td>3496</td>
<td>699</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>1435</td>
<td>1304</td>
<td>13335</td>
<td>620702</td>
<td>73060</td>
<td>7.9E+15</td>
<td>6134</td>
<td>6080</td>
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<tr>
<td>Proposed PACE Design</td>
<td>1435</td>
<td>590</td>
<td>8668</td>
<td>139658</td>
<td>38965</td>
<td>1.4E+15</td>
<td>2085</td>
<td>2614</td>
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<tr>
<td>Reduction¹</td>
<td>-12%</td>
<td>100%</td>
<td>91%</td>
<td>91%</td>
<td>-110%</td>
<td>96%</td>
<td>40%</td>
<td>-274%</td>
</tr>
</tbody>
</table>

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease

### Discharged Pollutant Concentration for Average Annual Storm Event

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>TP Discharged (mg/l)</th>
<th>TN Discharged (mg/l)</th>
<th>TSS Discharged (mg/l)</th>
<th>BOD Discharged (mg/l)</th>
<th>Total Coliform Discharged (MPN/100ml)</th>
<th>Oil/Grease Discharged (mg/l)</th>
<th>TPH Discharged (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>132</td>
<td>27</td>
<td>428</td>
<td>5.3</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>0.4</td>
<td>4.0</td>
<td>240</td>
<td>20</td>
<td>4.5E+05</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>0.2</td>
<td>2.2</td>
<td>36</td>
<td>10</td>
<td>8.0E+04</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Reduction¹</td>
<td>100%</td>
<td>92%</td>
<td>92%</td>
<td>-88%</td>
<td>96%</td>
<td>47%</td>
<td>-235%</td>
</tr>
</tbody>
</table>

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease
Duck Watershed Region A Existing Condition

Step 1 - Onsite Runoff

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth (^1) (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
<th>Runoff Total Coliform (MPN)</th>
<th>Runoff Oil/Grease (lbs)</th>
<th>Runoff TPH (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>10.7</td>
<td>1285</td>
<td>461447</td>
<td>94946</td>
<td>1496208</td>
<td>18528</td>
<td>3.6E+16</td>
<td>3496</td>
<td>699</td>
</tr>
</tbody>
</table>

\(^1\) - Runoff depths provided by PACE

Step 2 - Lake Dilution (n/a because no lakes in existing condition)

Step 3 - Lake Treatment (n/a because no lakes in existing condition)

Step 4 - Site Discharge

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
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<td>1496208</td>
<td>18528</td>
<td>3.6E+16</td>
<td>3496</td>
<td>699</td>
</tr>
</tbody>
</table>
### Duck Watershed Region A Alternative Proposed Design Condition

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth 1 (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
<th>Runoff Total Coliform (MPN)</th>
<th>Runoff Oil/Grease (lbs)</th>
<th>Runoff TPH (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>11.9</td>
<td>1435</td>
<td>1304</td>
<td>13335</td>
<td>620702</td>
<td>73060</td>
<td>7.9E+15</td>
<td>6134</td>
<td>6080</td>
</tr>
</tbody>
</table>

1. Runoff depths provided by PACE.

**Step 2 - Lake Dilution** (n/a because no lakes in alternative proposed condition)

**Step 3 - Lake Treatment** (n/a because no lakes in alternative proposed condition)

**Step 4 - Site Discharge**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
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<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>1435</td>
<td>1304</td>
<td>13335</td>
<td>620702</td>
<td>73060</td>
<td>7.9E+15</td>
<td>6134</td>
<td>6080</td>
</tr>
</tbody>
</table>
## Duck Watershed Region A Proposed PACE Design Condition

### Step 1 - Onsite Runoff

**Pollutant Load in Runoff for Project Site**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth $^1$ (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
<th>Runoff Total Coliform (MPN)</th>
<th>Runoff Oil/Grease (lbs)</th>
<th>Runoff TPH (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>11.9</td>
<td>1435</td>
<td>1304</td>
<td>13335</td>
<td>620702</td>
<td>73060</td>
<td>7.9E+15</td>
<td>6134</td>
<td>6080</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

### Step 2 - Lake Dilution

**Pollutant Concentration after Mixing of Urban Runoff and Lake Water**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Lake Volume (AF)</th>
<th>Diluted TP (mg/l)</th>
<th>Diluted TN (mg/l)</th>
<th>Diluted TSS $^1$ (mg/l)</th>
<th>Diluted BOD $^1$ (mg/l)</th>
<th>Diluted Total Coliform $^1$ (MPN/100ml)</th>
<th>Diluted Oil/Grease $^1$ (mg/l)</th>
<th>Diluted TPH $^1$ (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>0</td>
<td>0.3</td>
<td>3.4</td>
<td>159</td>
<td>19</td>
<td>4.4E+05</td>
<td>1.6</td>
<td>1.6</td>
</tr>
</tbody>
</table>

1 - Lake concentrations n/a for these constituents. However, dilution will occur but as of yet, is unmonitored for these constituents. Thus, dilution is not applied for these constituents.

### Step 3 - Lake Treatment

**Pollutant Concentration after Wet Pond BMP Application**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Treated TP (mg/l)</th>
<th>Treated TN (mg/l)</th>
<th>Treated TSS (mg/l)</th>
<th>Treated BOD (mg/l)</th>
<th>Treated Total Coliform (MPN/100ml)</th>
<th>Treated Oil/Grease (mg/l)</th>
<th>Treated TPH (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>0.2</td>
<td>2.2</td>
<td>36</td>
<td>10</td>
<td>80024</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

### Step 4 - Site Discharge

**Pollutant Load Discharged from Project Site**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>1435</td>
<td>590</td>
<td>8668</td>
<td>139658</td>
<td>38965</td>
<td>1.4E+15</td>
<td>2085</td>
<td>2614</td>
</tr>
</tbody>
</table>
Duck Watershed
Region B – Residential

Water Quality Modeling
Calculations & Summary
## Mariposa Lakes, Stockton, CA
### Water Quality Modeling Summary

**Duck Watershed - Region B**

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
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<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>733</td>
<td>263245</td>
<td>54165</td>
<td>853554</td>
<td>10570</td>
<td>2.0E+16</td>
<td>1994</td>
<td>399</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>784</td>
<td>592</td>
<td>6869</td>
<td>177799</td>
<td>36579</td>
<td>1.1E+16</td>
<td>2901</td>
<td>2893</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>784</td>
<td>194</td>
<td>3441</td>
<td>22845</td>
<td>11141</td>
<td>1.1E+15</td>
<td>563</td>
<td>710</td>
</tr>
<tr>
<td>Reduction</td>
<td>-7%</td>
<td>100%</td>
<td>94%</td>
<td>97%</td>
<td>-5%</td>
<td>95%</td>
<td>72%</td>
<td>-78%</td>
</tr>
</tbody>
</table>

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease.

### Discharged Pollutant Concentration for Average Annual Storm Event

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<td>132</td>
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<td>428</td>
<td>5.3</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>0.4</td>
<td>3.9</td>
<td>95</td>
<td>16</td>
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<td>1.3</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>0.1</td>
<td>1.6</td>
<td>10.7</td>
<td>5.2</td>
<td>1.1E+05</td>
<td>0.3</td>
<td>0.33</td>
</tr>
<tr>
<td>Reduction</td>
<td>100%</td>
<td>94%</td>
<td>97%</td>
<td>1%</td>
<td>95%</td>
<td>74%</td>
<td>-67%</td>
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**Step 1 - Onsite Runoff**

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<tr>
<th>Precipitation</th>
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\(^1\) - Runoff depths provided by PACE

**Step 2 - Lake Dilution (n/a because no lakes in existing condition)**

**Step 3 - Lake Treatment (n/a because no lakes in existing condition)**

**Step 4 - Site Discharge**

<table>
<thead>
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**Duck Watershed Region B Alternative Proposed Design Condition**

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth $^1$ (in)</th>
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<tr>
<td>Average Annual</td>
<td>11.4</td>
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<td>6869</td>
<td>177799</td>
<td>36579</td>
<td>1.1E+16</td>
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</tr>
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$^1$ - Runoff depths provided by PACE

**Step 2 - Lake Dilution** *(n/a because no lakes in alternative proposed condition)*

**Step 3 - Lake Treatment** *(n/a because no lakes in alternative proposed condition)*

**Step 4 - Site Discharge**

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<td>36579</td>
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<td>2901</td>
<td>2893</td>
</tr>
</tbody>
</table>
### Duck Watershed Region B Proposed PACE Design Condition

#### Step 1 - Onsite Runoff

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth (^1) (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
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<td>36579</td>
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<td>2901</td>
<td>2901</td>
<td>2893</td>
</tr>
</tbody>
</table>

\(^1\) - Runoff depths provided by PACE

#### Step 2 - Lake Dilution

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Lake Diluted Volume (AF)</th>
<th>Diluted TP (mg/l)</th>
<th>Diluted TN (mg/l)</th>
<th>Diluted TSS (mg/l)</th>
<th>Diluted BOD (mg/l)</th>
<th>Diluted Total Coliform (^1) (MPN/100ml)</th>
<th>Diluted Oil/Grease (^1) (mg/l)</th>
<th>Diluted TPH (^1) (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>589</td>
<td>0.20</td>
<td>2.5</td>
<td>47.6</td>
<td>9.8</td>
<td>6.4E+05</td>
<td>0.78</td>
<td>0.77</td>
</tr>
</tbody>
</table>

\(^1\) - Lake concentrations n/a for these constituents. However, dilution will occur but as of yet, is unmonitored for these constituents. Thus, dilution is not applied for these constituents.

#### Step 3 - Lake Treatment

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Treated TP (mg/l)</th>
<th>Treated TN (mg/l)</th>
<th>Treated TSS (mg/l)</th>
<th>Treated BOD (mg/l)</th>
<th>Treated Total Coliform (^1) (MPN/100ml)</th>
<th>Treated Oil/Grease (^1) (mg/l)</th>
<th>Treated TPH (^1) (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>0.09</td>
<td>1.6</td>
<td>10.7</td>
<td>5.2</td>
<td>1.1E+05</td>
<td>0.26</td>
<td>0.33</td>
</tr>
</tbody>
</table>

\(^1\) - Lake concentrations n/a for these constituents. However, dilution will occur but as of yet, is unmonitored for these constituents. Thus, dilution is not applied for these constituents.

#### Step 4 - Site Discharge

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
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<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
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<th>TPH Discharged (lbs)</th>
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</thead>
<tbody>
<tr>
<td>Average Annual</td>
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<td>194.3</td>
<td>9441</td>
<td>22945</td>
<td>11141</td>
<td>1.1E+15</td>
<td>563.2</td>
<td>710.3</td>
</tr>
</tbody>
</table>
Branch Watershed

Water Quality Modeling
Calculations & Summary
## Branch Watershed

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>1052</td>
<td>377688</td>
<td>77712</td>
<td>1224623</td>
<td>15165</td>
<td>2.9E+16</td>
<td>2861</td>
<td>572</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>1125</td>
<td>839</td>
<td>9873</td>
<td>267426</td>
<td>53447</td>
<td>1.4E+16</td>
<td>4192</td>
<td>4164</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>1125</td>
<td>296</td>
<td>5228</td>
<td>39337</td>
<td>18635</td>
<td>1.7E+15</td>
<td>932</td>
<td>1171</td>
</tr>
<tr>
<td>Reduction</td>
<td>-7%</td>
<td>100%</td>
<td>93%</td>
<td>97%</td>
<td>-23%</td>
<td>94%</td>
<td>67%</td>
<td>-105%</td>
</tr>
</tbody>
</table>

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease

### Discharged Pollutant Concentration for Average Annual Storm Event

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>TP Discharged (mg/l)</th>
<th>TN Discharged (mg/l)</th>
<th>TSS Discharged (mg/l)</th>
<th>BOD Discharged (mg/l)</th>
<th>Total Coliform Discharged (MPN/100ml)</th>
<th>Oil/Grease Discharged (mg/l)</th>
<th>TPH Discharged (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>132</td>
<td>27</td>
<td>428</td>
<td>5.3</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>0.4</td>
<td>3.9</td>
<td>95</td>
<td>16</td>
<td>1.4E+06</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>0.1</td>
<td>1.7</td>
<td>12.9</td>
<td>6.1</td>
<td>1.2E+05</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Reduction</td>
<td>100%</td>
<td>94%</td>
<td>97%</td>
<td>-15%</td>
<td>95%</td>
<td>70%</td>
<td>-91%</td>
</tr>
</tbody>
</table>

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease
**Branch Watershed Existing Condition**

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Pollutant Load in Runoff for Project Site based on Agricultural Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
</tr>
<tr>
<td>Average Annual</td>
</tr>
</tbody>
</table>

$^1$ - Runoff depths provided by PACE

**Step 2 - Lake Dilution (n/a because no lakes in existing condition)**

**Step 3 - Lake Treatment (n/a because no lakes in existing condition)**

**Step 4 - Site Discharge**

<table>
<thead>
<tr>
<th>Pollutant Load Discharged from Project Site based on Agricultural Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
</tr>
<tr>
<td>Average Annual</td>
</tr>
</tbody>
</table>
Branch Watershed Alternative Proposed Design Condition

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
<th>Runoff Total Coliform (MPN)</th>
<th>Runoff Oil/Grease (lbs)</th>
<th>Runoff TPH (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>11.4</td>
<td>1125</td>
<td>839</td>
<td>9873</td>
<td>267426</td>
<td>53447</td>
<td>1.4E+16</td>
<td>4192</td>
<td>4164</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

**Step 2 - Lake Dilution** (n/a because no lakes in alternative proposed condition)

**Step 3 - Lake Treatment** (n/a because no lakes in alternative proposed condition)

**Step 4 - Site Discharge**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>1125</td>
<td>839</td>
<td>9873</td>
<td>267426</td>
<td>53447</td>
<td>1.4E+16</td>
<td>4192</td>
<td>4164</td>
</tr>
</tbody>
</table>
Branch Watershed Proposed PACE Design Condition

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth</th>
<th>Runoff Volume</th>
<th>Runoff TP</th>
<th>Runoff TN</th>
<th>Runoff TSS</th>
<th>Runoff BOD</th>
<th>Runoff Total Coliform</th>
<th>Runoff Oil/Grease</th>
<th>Runoff TPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>11.4</td>
<td>1125</td>
<td>839</td>
<td>9873</td>
<td>287428</td>
<td>53447</td>
<td>1.4E+16</td>
<td>4192</td>
<td>4164</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

**Step 2 - Lake Dilution**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Lake Diluted Volume</th>
<th>Diluted TP</th>
<th>Diluted TN</th>
<th>Diluted TSS</th>
<th>Diluted BOD</th>
<th>Diluted Total Coliform</th>
<th>Diluted Oil/Grease</th>
<th>Diluted TPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>596</td>
<td>0.21</td>
<td>2.6</td>
<td>57.1</td>
<td>11.4</td>
<td>6.6E+05</td>
<td>0.90</td>
<td>0.89</td>
</tr>
</tbody>
</table>

1 - Lake concentrations n/a for these constituents. However, dilution will occur but as of yet, is unmonitored for these constituents. Thus, dilution is not applied for these constituents.

**Step 3 - Lake Treatment**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Treated TP</th>
<th>Treated TN</th>
<th>Treated TSS</th>
<th>Treated BOD</th>
<th>Treated Total Coliform</th>
<th>Treated Oil/Grease</th>
<th>Treated TPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>0.10</td>
<td>1.7</td>
<td>12.9</td>
<td>6.1</td>
<td>1.2E+05</td>
<td>0.30</td>
<td>0.38</td>
</tr>
</tbody>
</table>

**Step 4 - Site Discharge**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged</th>
<th>TP Discharged</th>
<th>TN Discharged</th>
<th>TSS Discharged</th>
<th>BOD Discharged</th>
<th>Total Coliform Discharged</th>
<th>Oil/Grease Discharged</th>
<th>TPH Discharged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>1125</td>
<td>296.1</td>
<td>5228</td>
<td>39337</td>
<td>18635</td>
<td>1.7E+15</td>
<td>931.7</td>
<td>1170.7</td>
</tr>
</tbody>
</table>
North Little Johns Watershed

Water Quality Modeling
Calculations & Summary
### Mariposa Lakes, Stockton, CA
Water Quality Modeling Summary

North Little Johns Watershed

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
<th>BOD Discharged (lbs)</th>
<th>Total Coliform Discharged (MPN)</th>
<th>Oil/Grease Discharged (lbs)</th>
<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>267</td>
<td>95758</td>
<td>19703</td>
<td>310487</td>
<td>3845</td>
<td>7.4E+15</td>
<td>725</td>
<td>145</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>285</td>
<td>210</td>
<td>2452</td>
<td>74929</td>
<td>13389</td>
<td>3.3E+15</td>
<td>1020</td>
<td>1013</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>285</td>
<td>89</td>
<td>1505</td>
<td>14605</td>
<td>6359</td>
<td>5.2E+14</td>
<td>309</td>
<td>388</td>
</tr>
</tbody>
</table>

Reduction

-7% 100% 92% 95% -65% 93% 57% -167%

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease

<table>
<thead>
<tr>
<th>Site Condition</th>
<th>TP Discharged (mg/l)</th>
<th>TN Discharged (mg/l)</th>
<th>TSS Discharged (mg/l)</th>
<th>BOD Discharged (mg/l)</th>
<th>Total Coliform Discharged (MPN/100ml)</th>
<th>Oil/Grease Discharged (mg/l)</th>
<th>TPH Discharged (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Agricultural Land)</td>
<td>132</td>
<td>27</td>
<td>428</td>
<td>5.3</td>
<td>2.2E+06</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Alternative Design</td>
<td>0.4</td>
<td>3.9</td>
<td>95</td>
<td>16</td>
<td>1.4E+06</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Proposed PACE Design</td>
<td>0.1</td>
<td>1.9</td>
<td>18.9</td>
<td>8.2</td>
<td>1.5E+05</td>
<td>0.4</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Reduction

100% 93% 96% -55% 93% 60% -151%

1 - Reduction is calculated as % difference from existing condition to proposed PACE design, where (-) represents an increase & (+) represents a decrease
North Little Johns Watershed Existing Condition

**Step 1 - Onsite Runoff**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
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</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>10.7</td>
<td>267</td>
<td>95758</td>
<td>19703</td>
<td>310487</td>
<td>3845</td>
<td>7.4E+15</td>
<td>725</td>
<td>145</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

**Step 2 - Lake Dilution** *(n/a because no lakes in existing condition)*

**Step 3 - Lake Treatment** *(n/a because no lakes in existing condition)*

**Step 4 - Site Discharge**

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
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<td>725</td>
<td>145</td>
</tr>
</tbody>
</table>
North Little Johns Watershed Alternative Proposed Design Condition

### Pollutant Load in Runoff for Project Site

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth $^1$ (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
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</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>11.4</td>
<td>285</td>
<td>210</td>
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<td>74929</td>
<td>13389</td>
<td>3.3E+15</td>
<td>1020</td>
<td>1013</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

Step 2 - Lake Dilution (n/a because no lakes in alternative proposed condition)

Step 3 - Lake Treatment (n/a because no lakes in alternative proposed condition)

### Pollutant Load Discharged from Project Site

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
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</tr>
</tbody>
</table>
North Little Johns Watershed Proposed PACE Design Condition

Step 1 - Onsite Runoff

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Runoff Depth 1 (in)</th>
<th>Runoff Volume (AF)</th>
<th>Runoff TP (lbs)</th>
<th>Runoff TN (lbs)</th>
<th>Runoff TSS (lbs)</th>
<th>Runoff BOD (lbs)</th>
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<td>3.3E+15</td>
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<td>1013</td>
</tr>
</tbody>
</table>

1 - Runoff depths provided by PACE

Step 2 - Lake Dilution

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Lake Volume (AF)</th>
<th>Diluted TP (mg/l)</th>
<th>Diluted TN (mg/l)</th>
<th>Diluted TSS (mg/l)</th>
<th>Diluted BOD 1 (mg/l)</th>
<th>Diluted Total Coliform 1 (MPN/100ml)</th>
<th>Diluted Oil/Grease 1 (mg/l)</th>
<th>Diluted TPH 1 (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>35</td>
<td>0.25</td>
<td>3.0</td>
<td>86.2</td>
<td>15.4</td>
<td>8.3E+05</td>
<td>1.17</td>
<td>1.17</td>
</tr>
</tbody>
</table>

1 - Lake concentrations n/a for these constituents. However, dilution will occur but as of yet, is unmonitored for these constituents. Thus, dilution is not applied for these constituents.

Step 3 - Lake Treatment

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Treated TP (mg/l)</th>
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<th>Treated TPH (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>0.11</td>
<td>1.9</td>
<td>15.9</td>
<td>8.2</td>
<td>1.5E+05</td>
<td>0.40</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Step 4 - Site Discharge

<table>
<thead>
<tr>
<th>Precipitation</th>
<th>Volume of Water Discharged (AF)</th>
<th>TP Discharged (lbs)</th>
<th>TN Discharged (lbs)</th>
<th>TSS Discharged (lbs)</th>
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<th>TPH Discharged (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual</td>
<td>285</td>
<td>88.9</td>
<td>1505</td>
<td>14605</td>
<td>6359</td>
<td>5.2E+14</td>
<td>308.9</td>
<td>388.0</td>
</tr>
</tbody>
</table>