February 4, 2009 – Final Draft

Low Threat Waiver

Irrigated Agriculture in El Dorado County

Introduction

The State of California, Central Valley Regional Water Quality Control Board (Water Board) has developed a program for minimizing the migration of contaminants from agricultural operations to surface streams. For reasons described within the following report, El Dorado County agriculture poses little or no threat to surface water quality.

With this report the El Dorado County agricultural coalition is applying for a low-threat waiver. The proposed program includes taking the initiative to enhance water quality, improve on best management practices that are in place and install them in new crop areas.

Proposed Program

The proposed program elements for the El Dorado County growers are as follows:

- Develop an entity to provide oversight and management of the proposed program,
- Focus on water quality enhancement,
- Begin systematic identification of potential problem areas,
- Document existing and begin systematic installation of best management practices,
- Include commercial operators in the education and outreach program (food packers, juice processors, etc. within the irrigated agricultural areas with pollution prevention),
- Assist growers and other interested parties in pesticide selection and practices,
- Work with other organizations to assist in funding, development, and implementation of management practices,

- Continue to work with the UC Extension, Resource Conservation District(s), and the NRCS in pollution prevention from erosion and herbicide application, and
- Replace the current stream assessment and core monitoring programs with limited monitoring focused on those constituents expected with the crops grown and methods practiced.

El Dorado County agriculture is unique in a number of ways. In addition to the points discussed below, the farms are generally very small with the owner being the operator. There are some exceptions where private companies provide care and maintenance of vineyards and orchards, but the owners are still involved in oversight of the operation. The average size of a commercial operation is less than 20 acres. This number is misleading since most parcels are much larger than the irrigated crop acreage. One example farm is 24 acres in size but only 5 acres are planted in grapes. There are some parcels that are more intensely farmed but most are not. There are a number of natural conditions and other limitations that limit cropping intensity but there are situations where this is done by choice. Many streams are bordered by natural vegetation. This condition provides natural barriers between cropped areas and watercourses thus reducing the potential for migration of constituents from crop lands to surface waters.

As can be seen by the data in this report, water quality is excellent at the two monitoring sites. The only exception is the Ceriodaphnia Dubia failed bioassays in 2007 at the Coon Hollow Creek monitoring station. The failed bioassays were not connected with agricultural operations. Accordingly continued monitoring will do nothing to improve water quality. Programs involving erosion and sediment transport elimination and better management of pesticides will go further to improve water quality.

Concept – Proposed Program

The concept of a low threat waiver for irrigated agriculture is similar to the low threat waiver for small food processors and wineries. There is no physical water sampling or monitoring. An annual report is provided to the Water Board covering the previous year's activities. The major difference is that the report will be completed for all of the members of the group rather than for individual members. A group has been formed that will administer the program (similar to the coalition but only including El Dorado County growers). There are two non-profit corporations, a 501(c) (5), nonprofit mutual benefit corporation and a 501 (c) (3) nonprofit education corporation.

The proposed program will enhance water quality by source reduction and best management practices. There are natural conditions in El Dorado County that provide a barrier to migration of contaminants to surface waters, making the county an ideal candidate for a low threat waiver. There are also crops grown and irrigation methods used that minimize migration of contaminants. With the exception of a very few strawberry fields and commercial gardens, all crops grown are permanent crops (orchards, vineyards, Christmas trees, and permanent pasture). The main irrigation methods used are drip and trickle irrigation with some sprinkler irrigation in certain areas with certain crops. There are no known commercial agricultural operations utilizing surface irrigation systems in the county.

Even with all of the natural conditions and farming practices employed in El Dorado County there are some problems and improvements that can be made. This program includes a cooperative effort by coalition members and others to reduce any potential sources of water pollution. Over the past 3 years there have been a few exceedances found with the monitoring program at the main site – North Canyon Creek and a second site – Coon Hollow Creek. An example of this cooperation is the Coon Hollow Creek Investigation and Source Identification Study, a copy attached in Appendix A.

Background

Based on monitoring data, shown later in this report, water quality is excellent. Evidence of the excellent water quality is a "Catch and Release" Fishery on North Canyon Creek between the concentrated agricultural area and the monitoring station. The fish are Rainbow Trout that would not thrive or survive contaminated water.

The differences in commercial agriculture and physical conditions for El Dorado County that make the county a candidate for a low – threat waiver are:

- Fishery – Commercial trout fishery established on North Canyon Creek,
- Geography – Commercial agricultural areas are interspersed with native riparian habitat,
- Topography – Crops are more frequently planted on hillsides than on level land,
- Pesticide Usage – There is low pesticide use per acre of cropland,

- Irrigation practices – There are no surface irrigation systems, thus no tailwater,
- Vineyards – There are no dormant sprays used in the vineyards; sulfur is the primary chemical sprayed in the summer months,
- Dry farming – A significant portion of the county agricultural operations are practiced with little or no irrigation,
- Water resources – Water supplies are very limited so significant water conservation programs are needed and are in place,
- Erosion control – Due to the hilly terrain, most orchards and vineyards have cover crops to limit erosion during heavy winter rains,
- Agricultural isolation – Agricultural areas are not contiguous as found in most valley locations,
- Funding – A grant has been secured by the local Resource Conservation District and others planned to assist growers with development of individual BMPs, and
- Education and outreach.

Fishery

Mr. Larry Hyder has built a Rainbow Trout fishery within the North Canyon Creek by creating pools for a natural fish habitat. There are spawning areas within the stream. Mr. Hyder operates a "catch and release" program where visitors pay for fly fishing or fly fishing lessons. The creation and maintenance of this habitat is possible only due to the high quality of water in the stream. The fishery is located between the concentrated agricultural area and the stream monitoring station, thus providing evidence that agricultural activities in the area are not degrading water quality.

Geography and Topography

The geography and topography in El Dorado County are not conducive to row crops or annual crops. The predominant agriculture in the county consists of permanent vine and tree crops. Surface irrigation systems are not feasible thus limiting the potential for annual crop production and resulting in far less soil disturbance than found with row crops.

The primary agricultural areas within the county are interspersed within areas that are not suitable for agriculture. These include rocky areas and areas with soils that are not suitable for agriculture.

The geography in El Dorado County is such that most crops are planted on hillsides. Erosion control is mandatory to save topsoil for crop production. Most vineyards and orchards have cover crops to minimize soil losses.

El Dorado County has also passed an ordinance that requires all new plantings to be completed with a grading and erosion control plan. All new plantings must be permitted and include the provision of best management practices adopted by the county.

Additionally, lands adjacent to crop areas are generally inaccessible with farm equipment leaving a natural vegetation buffer that provides filtering of runoff from cultivated areas. The combination of erosion control and natural filters reduce suspended solids in runoff.

Pesticide Usage

The California Department of Pesticide Regulation publishes pesticide use data. The most recent summaries are for 2004 & 2005. The pesticide used is much less than other agricultural regions in the 58 counties in California. El Dorado County ranked 44th in pesticide use in 2004 and 45th in 2005.

Irrigation Practices

Within the agricultural industry, El Dorado County is unusual in that there is no surface irrigation as practiced in the valley regions. A majority of the vineyards are irrigated with drip irrigation systems. Some irrigate with sprinkler systems. All pasture is irrigated with sprinklers. In the southern part of El Dorado County (a major wine grape growing region) irrigation supplies are limited to poor producing wells and significant acreage is dry farmed. Grapes grown for wine making are also typically irrigated in a deficit mode. This improves the quality of the grapes for making better wines, and it also encourages deeper penetration of the vine roots to obtain subsurface soil moisture.

Both irrigation methods and practices in El Dorado County minimize the threat of constituents of interest entering surface waters.

Dryland Farming

A number of crops are grown without irrigation, especially in the south county where there is no piped water available. This results in no runoff from commercial

agriculture except for winter rains. These farms are not part of the irrigated lands program but serve as buffers between those lands that are irrigated and water courses.

Water Resources

The short supply of water throughout El Dorado County has forced the water purveyors to implement strict water conservation measures, thus minimizing the probability for runoff of irrigation water.

There are two main water purveyors in El Dorado County on the western slope. They are El Dorado Irrigation District and Georgetown Divide Public Utility District. The El Dorado Irrigation District has an aggressive water conservation program called the Irrigation Management Service. This program is described on the District's web site, shown in Appendix B. The designated agricultural areas served by each and/or wells are shown on Table 1. The El Dorado County Water Agency covers the entire county with representatives from the Districts on the Agency Board of Directors. A map of the Districts' boundaries is depicted on Figure 1. This map was provided by the El Dorado Water and Power Authority.

Table 1 - Water Sources for Designated Agricultual Areas

Designated Agricultural Area	Water Source
Camino/Fruitridge	EID
Coloma	EID & Wells
Fairplay	Wells
Garden Valley	GDPUD
Gold Hill	EID
Oak Hill	EID & Wells

Erosion Control

The County of El Dorado passed an ordinance in February 2007 that requires all new agriculture plantings to have an erosion control plan to ensure utilization of best management practices. The Board of Supervisors adopted a number of Best Management Practices that complement the ordinance requirements. This ordinance has been implemented.

Agricultural Area Isolation

El Dorado County has seven somewhat isolated agricultural areas. As stated above, topography, native forests, and residential communities create the isolation.

The seven Districts are identified in the El Dorado County General Plan. They are the Coloma, Gold Hill, Oak Hill, Fairplay, Pleasant Valley, Camino/Fruitridge, and Garden Valley Districts. These districts are shown on Figure 2. Agricultural preserves are shown on Figure 3. Both maps were provided by the El Dorado County Surveyor's Office. Figure 4 is a land use map prepared by the El Dorado County Planning Department.

The total irrigated acreage represented in the coalition is slightly greater than 3,000 acres. This represents an estimated 75% of the total irrigated acreage. The annual farm report does not distinguish between vineyards or tree crops that are irrigated and those that are not. The member average irrigated land area is 10 acres.

The vegetative cover was determined in the South Fork American River Watershed report. The percentage in agriculture was 0.76 percent.

The isolation of the principal growing regions demonstrates the separation of agricultural operations with native lands, forested areas, and other land uses. All of these separations provide buffers between growing areas and surface waters. These buffers filter or take up constituents that might otherwise migrate to surface waters.

Additionally, the average farm parcel is 27 acres of which an average of 8 acres is farmed. The remainder is typically in native vegetation. Those growers that are in the EID IMS program have an average of 30% of their land in production.

Constituents of Concern

Major constituents of concern that can potentially enter surface waters are included in the following categories:

- Nitrogen and Phosphorus
- Soluble organics
- Suspended Solids
- Pesticides

Each of these categories will be discussed and rationale provided on how the transport of each is minimized in El Dorado County. Most of the controls are in the area of source reduction.

Nitrogen and Phosphorus

Nitrogen is found in the agricultural environment in three forms. They are organic nitrogen, ammonia, and nitrate forms. The organic and ammonia forms of nitrogen will attach to the soils or organics in the soils. Nitrate is soluble and will migrate with runoff water. Phosphorus also attaches to the soils or organic matter.

Erosion control limits migration of organic nitrogen, ammonia, and phosphorus. Migration of nitrates is limited by field runoff control and limitation of irrigation leaching fraction.

Also, farmers limit nitrogen to enhance crop quality in a significant portion of the crops grown, such as wine grapes.

Soluble Organics

Soluble organics is a group of constituents that migrate with water. Migration is minimized through water conservation.

Suspended Solids

Suspended solids migration is controlled by erosion control techniques. Farming practices in El Dorado County include the predominant use of cover crops in orchards and vineyards. There are also many riparian borders between the cropped area and surface water streams.

Pesticides

Pesticides are primarily used for the major crops grown – grapes and mixed fruit orchards (primarily pears and apples). Both farmers and others use round up for weed control. The only significant pesticide used by grape growers is sulfur applied in the summer months. There are occasions where chemicals are used for mite control and mealy bug eradication.

Transport of pesticides is minimized by grower attention to detail. Pesticides migrate through runoff from the fields and aerosol drift from spraying operations. The runoff from fields is insignificant due to the irrigation management practices in place. Aerosol drift is controlled by calibration of sprayers and timing of application to avoid wind direction and velocity. The El Dorado County growers have an additional advantage with the native vegetative buffers between surface waters and application sites.

Vineyards

One predominant crop grown in the county is wine grapes. Unlike table grapes, wine grapes are generally grown with deficit irrigation and minimization of nitrogen. Table grapes are grown with nitrogen applications of 110 – 120 pounds nitrogen per acre per year. By contrast wine grapes are typically limited to only 30 – 35 pounds per acre per year, resulting in the reduced probability for the loss of nitrogen to surface water.

Public Agency/Private Entity Programs

In addition to the El Dorado County ordinance, there are other governmental programs available to farmers. These include the USDA – NRCS, the local Resource Conservation Districts, the University of California Extension, and the Farm Bureau. Each has education programs for all types of crops as well as water pollution control training seminars. The NRCS has specific best management practices for the soils found in and crops grown in El Dorado County.

The County of El Dorado has adopted a grading ordinance that covers any activity where a significant quantity of soil is disturbed. The County Agriculture Commissioner administers the agricultural section of the ordinance. Planting new vineyards or orchards cannot commence unless a permit is obtained from the agriculture commissioner. The permit is waived if the grower employees best management practices included in the ordinance. The BMPs were formally adopted by the El Dorado County Board of Supervisors.

The Department of Transportation (DOT) administers all other grading activities. The DOT also has instituted programs to minimize erosion and runoff from its own maintenance activities. Additionally all DOT workers that apply herbicides along the road right of ways attend annual training and are required to take and pass the same exam that is required of farmers. The DOT chemicals used for herbicides are reviewed and approved by the Agriculture Department.

In summary, new crop plantings are controlled by county ordinance that limits the transport of constituents to surface waters.

Data Review and Analysis

Sampling has been conducted at the North Canyon Creek site for three years. Sampling was conducted on Coon Hollow Creek in 2007 – 2008. A map showing these sites and watersheds is shown as Figure 5. The sampling locations were selected based on the concentration and variety of agricultural operations. There are no other locations in the county that have concentrated areas of mixed crops that are irrigated. There are scattered areas of irrigated pasture in El Dorado County, but no irrigated pasture within the watersheds for either of the selected monitoring sites. Therefore, these 2 sites represent the "worst case" scenario for potential contamination of surface waters.

North Canyon Creek

During the past three years there have been relatively few excursions or exceedances of the constituents analyzed. Most of the exceedances have been non – agricultural in origin. One exception was an exceedance in 2005 for diazinon. Diazinon is a dormant spray used on the fruit orchards in the Camino area.

Coon Hollow Creek

Coon Hollow Creek was monitored only in 2007/2008 year. A detailed investigation report is attached as Appendix A. The conclusion of that report was that the failed bioassays (*Ceriodaphnia dubia*) and the exceedances of DDT/DDE and E. coli were from non – agricultural sources.

All Data

Data from both sampling sites are summarized by constituent in the following tables. The full data set can be found in the investigation report (Appendix A). Other constituent results are well within basin water quality objectives and in fact show no hint of significant constituents impacting water quality. In addition to DDE/DDT numerous pesticides were analyzed with none reported in excess of water quality objectives. There were however, three instances where other pesticides were detected at the Coon Hollow site. These results are shown in Table 2.

Table 2 - Pesticides Detected in Coon Hollow Creek Water Samples			
Sample Date	**Location**	**Pesticide**	**Concentration**
4/25/2007	Main Monitoring Station	Atrazine	0.066 ug/L
7/18/2007	Main Monitoring Station	Endrin Ketone	0.003 ug/L
7/18/2007	Main Monitoring Station	Chlorpyrifos	0.003 ug/L

Follow up samples were taken at a site upstream from the Coon Hollow monitoring station. The follow up site was adjacent to North Canyon Road. Note that no pesticides were detected in these two samples.

Water quality data are provided in Tables 3 – 11 at the end of this report.

Concentrations of nitrogen compounds are summarized in Table 3. The lack of ammonia found in Coon Hollow Creek eliminates it as a possibility for the failed *Ceriodaphnia Dubia* bioassays. The sensitivity of this organism to ammonia depends on the water pH; but at any pH, the concentration must be greater than 3 mg/L. The basin plan limit for total nitrogen is 10 mg/L. These results are far less than either concentration.

The levels of TDS and conductivity (each a different measure of the salts in a water sample) shown on Tables 4 and 5 respectively are extremely low and well within the basin plan objective for the American River watershed of 125 mg/L. This indicates that there are no significant wastes being discharged into the stream.

Under the right conditions a low hardness level (Table 6) can cause a failed bioassay, but there is no correlation in this case. The one sample where the hardness was not detectable, the bioassay was 100% survival.

As shown in Table 7, the dissolved oxygen levels are above action levels (5.0 mg/L) for either warm water or cold water fish (7.0 mg/L). The high levels are indicative of a water source that has very low levels of nutrients and organics

The turbidity levels are shown in Table 8. The water quality objective for turbidity depends on the upstream turbidity and provides a limit on the increase in turbidity. There is no data upstream from either location. There is a pond upstream from the Coon Hollow monitoring station which has a large population of ducks and geese. The turbidity levels at Coon Hollow are likely due to discharge from the pond. There was no rainfall that could cause erosion from farm lands in August or September.

The alkalinity levels are quite low indicating the lack of chemical constituents entering the stream. There is no water quality objective for alkalinity. The

average alkalinity in the EID water supply system for the Camino area was 16.1 mg/L in their 2007 Water Quality Report.
The suspended solids concentrations shown in Table 10 are for the most part quite low. There are 2 test results at Coon Hollow showing higher levels of suspended solids but are most likely due to algae in the upstream pond overflow. There is no specific water quality objective for suspended solids.

Conclusion

Based on the above data tables there is no significant contribution of constituents of concern from agricultural operations. This is not a surprising conclusion based on the crops grown and farming practices used in El Dorado County. Continued core and assessment monitoring will provide no further useful information. Since crops grown in this area are permanent crops, there are no changes in field operations that would change the monitoring results.

Implementation and Administering Entity

The El Dorado County Watershed Advisory Group was an informal group of those interested parties in agriculture including farmers, agency representatives, Farm Bureau, and consultants. This group was working on the program, but the effort has been transferred to a new growers group that has recently been formed. There are two corporations that now oversee the program. The principal group is the El Dorado County Agricultural Water Quality Management Corporation (EDCAWQMC) a 501(c) 5 corporation. The group is composed of growers who are part of the coalition. The UC Extension, El Dorado County Agriculture Department, the USDA NRCS, and the two Resource Conservation Districts in El Dorado County provide technical support.

The EDCAWQMC provides the following services:

- Overall program administration
- Liaison with Sacramento Valley Coalition for program administration
- Maintains membership list and database
- Manages budgets and collects dues
- Holds monthly meetings for program oversight

The second entity, El Dorado Agricultural Water Education Corporation (EDAWEC), is a 501 (c) 3 and was formed for education, outreach, grower assistance, and to obtain grant money for the same.

The EDAWEC provide the following services:

- Program coordination,
- Liaison with the Sacramento Valley Coalition technical issues,
- Grants for grower assistance and outreach,
- Annual Water Board Report,
- Organize on-going programs for
    - Outreach,
    - Education, and
    - Technical issues
- Maintain a membership list and database, and
- Handle problems that may occur with the program.

Outreach and Education

EDAWEC was created in 2008 and was filed with the California Secretary of State office March 21, 2008. The EDAWEC is a nonprofit public benefit corporation. As such the corporation can seek and obtain grants for education and outreach programs. The corporation works with the El Dorado County Farm Bureau, the University of California Cooperative Extension, the El Dorado and Georgetown Divide Resource Conservation Districts, and the Natural Resource Conservation Service.

Specific programs completed or scheduled include:

- Farmland Self Assessment Workbook – These pocket-sized workbooks have been provided to members. The workbooks allow the member to inventory their operation looking for possible problem areas. The member then can develop best management practices to solve or mitigate potential problems.
- Development of the Growers Advisory Group. This group was formed and is a part of the bylaws of the Agricultural Water Quality Corporation. The group provides information to growers and is an avenue for feedback from the growers.
- Seminars have been scheduled for calibration of pesticide spray rigs and for erosion control.
- The Agricultural Education Corporation is actively pursuing grant money and coordinating with other agencies for increased education and outreach.
- A grant was obtained by the El Dorado Resource Conservation District to evaluate farms and plan best management practices.

TABLES

Table 3. Ntirogen Compounds, mg/L		
Date, Place	NO_3	NH_3
1/26/05, N.C.		ND
3/19/05, N.C.		0.04
5/04/05, N.C.		ND
5/04/05, N.C.		ND
6/07/05, N.C.		ND
7/06/05, N.C.		ND
8/02/05, N.C.		ND
9/06/05, N.C.		ND
3/1/06, N.C.	1.000	ND
3/16/06, N.C.	0.190	ND
5/25/06, N.C.	0.720	ND
5/25/06. N.C.		ND
6/22/06, N.C.	0.830	ND
6/22/06, N.C.		ND
7/19/06, N.C.	0.740	ND
7/19/06, N.C.	ND	ND
8/17/06, N.C.	0.580	ND
8/17/06, N.C.	ND	ND
9/21/06, N.C.	0.006	ND
9/21/06, N.C.	ND	ND
4/17/07, C.H.	1.800	ND
5/16/07, C.H.	2.100	ND
6/19/07, C.H.	1.900	0.055
7/18/07, C.H.	0.047	ND
7/18/07, C.H.	2.000	ND
8/22/07, C.H.	2.000	ND
9/18/07, C.H.	2.100	ND
Average	1.144	ND

Table 4. Total Dissolved Solids	
Date, Place	TDS, mg/L
1/26/2005, N.C.	53
3/19/2005, N.C.	68
5/4/2005, N.C.	38
5/4/2005, N.C.	50
6/7/2005, N.C.	74
7/6/2005, N.C.	140
8/2/2005, N.C.	160
9/6/2005, N.C.	140
10/4/2005, N.C.	160
5/25/2006, N.C.	50
6/22/2006, N.C.	79
7/19/2006, N.C.	67
8/17/2006, N.C.	80
9/21/2006, N.C.	70
4/17/2007, C.H.	63
6/19/2007, C.H.	51
7/18/2007, C.H.	57
8/22/2007, C.H.	64
9/18/2007, C.H.	47
Average	80

Table 5. Conductivity	
Date, Place	Concentration, uS/cm
1/26/2005, N.C.	89
3/19/2005, N.C.	79
5/4/2005, N.C.	99
6/7/2005, N.C.	99
6/28/2005, N.C.	198
7/6/2005, N.C.	204
8/2/2005, N.C.	237
9/6/2005, N.C.	251
10/4/2005, N.C.	217
5/25/2006, N.C.	90
6/22/2006, N.C.	100
7/19/2006, N.C.	100
8/17/2006, N.C.	100
9/21/2006, N.C.	100
4/17/2007, C.H.	69
4/25/2007, C.H.	67
5/16/2007, C.H.	64
6/19/2007, C.H.	68
7/18/2007, C.H.	85
8/22/2007, C.H.	59
9/18/2007, C.H.	69
Average	116

Table 6. Hardness	
Date, Place	Concentration, mg/L
1/26/2005, N.C.	47
3/19/2005, N.C.	42
5/4/2005, N.C.	40
5/4/2005, N.C.	36
6/7/2005, N.C.	40
7/6/2005, N.C.	90
8/2/2005, N.C.	122
9/6/2005, N.C.	94
5/25/2006, N.C.	90
6/22/2006, N.C.	100
7/19/2006, N.C.	100
8/17/2006, N.C.	100
9/21/2006, N.C.	100
4/17/2007, C.H.	36
5/16/2007, C.H.	60
6/19/2007, C.H.	80
7/18/2007, C.H.	ND
8/22/2007, C.H.	32
9/18/2007, C.H.	30
Average	69

Table 7. Dissolved Oxygen	
Date, Place	Concentration, mg/L
1/26/2005, N.C.	10.21
3/19/2005, N.C.	10.5
5/4/2005, N.C.	9.67
6/7/2005, N.C.	9.23
7/6/2005, N.C.	9.3
8/2/2005	11.1
9/6/2005, N.C.	9.77
10/4/2005, N.C.	12.4
5/25/2006, N.C.	10.09
6/22/2006, N.C.	7.33
7/19/2006, N.C.	9.8
8/16/2006, N.C.	9.2
9/21/2006, N.C.	9.9
4/17/2007, C.H.	9.23
4/25/2007, C.H.	9.93
5/16/2007, C.H.	10.50
6/19/2007, C.H.	10.50
7/18/2007, C.H.	7.10
8/22/2007, C.H.	11.42
9/18/2007, C.H.	10.07
Average	9.59

Table 8. Turbitity	
Date, Place	NTU
1/26/2005, N.C.	7
3/19/2005, N.C.	5.2
5/4/2005, N.C.	1.4
5/4/2005, N.C.	1.5
6/7/2005, N.C.	1.6
7/6/2005, N.C.	1.6
8/2/2005, N.C.	3.3
9/6/2005, N.C.	22
10/4/2005, N.C.	2.3
5/25/2006, N.C.	3
6/22/2006, N.C.	4.1
7/19/2006, N.C.	7.4
8/16/2006, N.C.	1.1
9/21/2006, N.C.	1.8
4/17/2007, C.H.	8.2
6/19/2007, C.H.	4.7
7/18/2007, C.H.	6.0
8/22/2007, C.H.	24.0
9/18/2007, C.H.	15.0
Average	6.4

Table 9. Alkalinity	
Date, Place	**Alkalinity, mg/L**
1/26/2005, N.C.	26
3/19/2005, N.C.	35
5/4/2005, N.C.	29
5/4/2005, N.C.	32
6/7/2005, N.C.	36
7/6/2005, N.C.	98
8/2/2005, N.C.	96
9/6/2005, N.C.	98
5/25/2006, N.C.	39
6/22/2006, N.C.	38
7/19/2006, N.C.	37
8/17/2006, N.C.	37
9/21/2006, N.C.	35
Average	49

Table 10. Total Suspended Solids	
Date, Place	**TSS, mg/L**
1/26/2005, N.C.	10
3/19/2005, N.C.	32
5/4/2005, N.C.	0
5/4/2005, N.C.	3
6/7/2005, N.C.	3
7/6/2005, N.C.	0
8/2/2005, N.C.	0
9/6/2005, N.C.	0
10/4/2005, N.C.	0
3/1/2006, N.C.	12
3/16/2006, N.C.	0
5/25/2006, N.C.	3
6/22/2006, N.C.	0
7/19/2005, N.C.	18
8/17/2005, N.C.	0
9/21/2006, N.C.	0
2/11/2007, C.H.	14
4/17/2007, C.H.	30
4/17/2007, C.H.	15
5/16/2007, C.H.	0
6/19/2007, C.H.	8
7/18/2007, C.H.	42
8/22/2007, C.H.	34
9/18/2007, C.H.	7
Average	10

Figure 1 here

- Figure 2 here

Figure 3 here

Figure 4 here

Figure 5 here