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Illinois Environmental Protection Agency
Springfield, Illinois

Submitted by:
AECOM
Vernon Hills, Illinois
60089645
November, 2009

# Final Report

**Countryside Lake**
**Water Quality Monitoring Program**

Project No. 60089645

November, 2009

**Prepared by:**
Doug Hermann
Principal Engineer
AECOM
D 847.279.2480 C 847.687.8093

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# Final Report

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**Prepared by**

**AECOM**

**750 Corporate Woods Parkway**

**Vernon Hills, IL 60061**

**Prepared for:**

**Illinois Environmental Protection Agency**

**Bureau of Water – Watershed Management Section**

**1021 N. Grand Avenue East, P.O. Box 19276**

**Springfield, Illinois 62794-9276**

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# Executive Summary

Countryside Lake Association (CLA) started a Lake Stewardship program in 2001 following the Lake Water Quality Study completed by the Lake County Health Department Lake Management Unit (LCHD-LMU) in 2000. The LMU study identified Countryside Lake as “hyper-eutrophic” citing phosphorous as the limiting nutrient. The CLA stewardship program focused its attention on lake water inlet quality to determine whether any of these stormwater drains represented a significant phosphorous input to the lake. The program began with grab sample collections at the major lake inlets in 2002 and 2003 and progressed to ISCO automatic composite water samplers and ultimately to selected ISCO sequential samplers. The early findings documented the baseline water quality for each inlet.

Initially, used composite samplers were purchased by CLA in 2003. The Illinois EPA Section 319 funding resources available through the Illinois EPA Section 319 Financial Assistant Agreement – 3190612 provided CLA the opportunity to upgrade the samplers to newer and more reliable sampling equipment. The 319 funds were also utilized to upgrade the Solinst Levellogger used to measure flow at the Gilmer Road culvert to a Marsh-McBirney Flo-tote 3 flowmeter. Sampling protocol and equipment utilized in the monitoring program, which was a part of this Grant, is described in the report along with all of the data, trends and comparisons to the appropriate water quality standards. In 2004 significant turbid flows were noted from the Indian Creek water inlet to the lake. This information was reported to LMU and Illinois EPA. It was soon determined that the source of this turbid water was from the Toll Brothers Hawthorn Woods Country Club (HWCC) residential and golf course development. In 2005 CLA began monitoring Indian Creek at the Gilmer Road culvert just downstream and “in series” with the Chevy Chase Road culvert farther downstream. Soon after this monitoring began, the samplers were upgraded with funds allocated from the Illinois EPA 319 to sequential sampling capability at both locations to understand the mass transport of sediment and phosphorous during a storm event.

The sampling and analysis program associated with these samplers is described further in the report and was very helpful to LMU and Illinois EPA in its prosecution of the water quality violations associated with HWCC. These water quality violations were part of a settlement between HWCC and the Illinois Attorney General’s office in 2008.

More recently, water quality improvements in the Indian Creek main stem have been noted, likely in response to improved re-vegetation of the partially developed and undeveloped residential areas at HWCC. Water quality data collected by this Grant and previous monitoring is being provided to the Indian Creek Watershed Partnership.

# 1.0 Introduction and Project Background

## 1.1 Project Location

Countryside Lake is located in unincorporated Fremont Township adjacent to the Village of Mundelein (T44N, R11E, Section 27, 34, 35). The project location is shown in Figure 1 in Appendix A.

Countryside Lake is a shallow 142-acre man-made impoundment. The current maximum water depth is 10 feet with an average depth of 6.1 feet from normal pool (Veolia Environmental Services formerly Superior Special (Hydrographic) Services, 2002). Lake water volume at normal pool is estimated to be approximately 895 acre feet (surface area * average depth). Countryside Lake is part of the headwaters of the Indian Creek Watershed which is a drainage basin of the Des Plaines River watershed. Indian Creek is also the major tributary to Countryside Lake. About 1780 acres of the watershed as reported by Lake County Health Department-Lakes Management Unit (LCHD-LMU) are located upstream of the lake.

There are no major lakes or impoundments that drain into Countryside Lake, with only Manning Slough (natural), several small storm water basins and one large wastewater treatment basin that serves HWCC. There is also one minor tributary (Liberacki drain) located in the southern end of a far western cove and two storm drains on the north shore (Donohoe and Larsen drains). The lake outlet is a large, (approximately 12-foot wide by 2 feet deep) concrete flattened ogee spillway situated on a concrete core wall with a clay shell embankment at the southeast end of the lake. An ogee spillway is shaped to allow the water nappe to cling to the spillway face. The spillway discharge continues the flow of Indian Creek, which eventually drains into the Des Plaines River.

## 1.2 2000 - 2008 Lake Water Quality Study Findings by LCHD-LMU

Water samples collected by LCHD-LMU during a 2000 study for Countryside Lake were analyzed for a variety of water quality parameters. Below is a discussion of highlights from the water quality data collected over the year 2000 five-month (summer) study of Countryside Lake.

The 2000 study used Secchi disk depth is a direct indicator of clarity as well as overall water quality. In general, the greater the Secchi disk depth, the clearer and better the water quality. Secchi disk readings in Countryside Lake consistently declined over the five-month study. The cause of the decrease in Secchi disk depth was lake-wide algal blooms. Besides decreasing Secchi disk depth, lake-wide algal blooms negatively impacted other water quality parameters.

Algae need light and nutrients, most importantly carbon, nitrogen (N) and phosphorus (P), to grow. Light and carbon are not normally in short supply (limiting). Most lakes in Lake County are phosphorus limited. Countryside Lake had an average TN:TP ratio of 14:1. This means that neither nitrogen nor phosphorus was limiting. Of the two nutrients, phosphorus was the biggest concern. Phosphorus levels in Countryside Lake were considered high. Consequently, as phosphorus levels in Countryside Lake increased so did the degree of algal growth with corresponding decrease in Secchi depth. With the exception of May and June, phosphorus levels were near double the County average (0.066 mg/L) or greater.

Phosphorus originates from two sources. One source is from within the lake (internal). This is a common source of phosphorus in manmade lakes, which by their nature contain rich sediments. Biological and chemical processes release phosphorus from the anoxic sediments. Since Countryside Lake is not thermally stratified, released phosphorous can mix throughout the water. Additionally, sediment bound phosphorus is also mixed into the water column by wind/wave action and lack of aquatic plants (which stabilize sediments). The other main input of phosphorus is fertilizer sources located outside the lake (external).

Another way to look at phosphorus levels and how they affect productivity of the lake is to use a Trophic State Index (TSI) based on phosphorus. TSI is based on phosphorus levels, chlorophyll concentrations, and Secchi disk depth to classify and compare lake productivity levels (trophic state). Based on a TSI phosphorus value of 71.3, Countryside Lake is classified as hyper-eutrophic (>70 TSI). This means that the lake is a highly productive system that has above average nutrient levels and high algal biomass (growth). Field observations reinforce that Countryside Lake is hyper-eutrophic. Most manmade lakes in the county are eutrophic (50 < TSI values < 70). Of all lakes in Lake County studied by the LMU up to 2000, Countryside Lake ranked 73rd out of 87 lakes based on average TSI. The LMU study in 2000 showed Countryside Lake ranked 24th out of 32. Today, Countryside Lake ranks 75th out of 163 lakes for TSI in the County.

LMU Water Quality Studies were renewed at Countryside Lake in 2005 and will be continued on an annual basis through 2009. The findings of these studies are available at:

http://oldapps.lakecountyil.gov/health/pdfs/ehs/lakereports/cntrysde.pdf
http://oldapps.lakecountyil.gov/health/pdfs/ehs/lakereports/Countyside05.pdf
http://oldapps.lakecountyil.gov/health/pdfs/ehs/lakereports/2006Countryside.pdf
http://oldapps.lakecountyil.gov/health/pdfs/ehs/lakereports/2007Countryside.pdf
http://oldapps.lakecountyil.gov/health/pdfs/ehs/lakereports/countryside08.pdf

A summary report of the annual surveys will be issued by LMU in 2010.

Another area of concern identified by LMU for Countryside Lake was sedimentation. Sedimentation can bring about negative impacts on the lake's fishery and aquatic plant community as well as increase algal blooms, turbidity and decrease lake health. LMU closely associates phosphorus levels with sedimentation. The silts and clays associated with the glacial tills in Lake County have closely bound phosphorus. When nutrient laden sediments are deposited in the lake bottom, phosphorus has direct impact to the water column particularly in a well mixed shallow lake like Countryside Lake. Through 2000 the lake historically had been tributary via Indian Creek to agricultural land uses in the upstream watershed which were gradually being developed for residential use. In 2001, the Association learned that much of the remaining undeveloped watershed (+670 acres) would also be developed with a golf course and about 600 homes. In response to LMU advice and a keen awareness of changing water quality conditions, the Association began a lake stewardship program supported by member volunteers and funded by Association dues.

### 1.3 Association Stewardship and Major Inlets and Lake Outlet Water Quality Testing

Countryside Lake Association (CLA) established a Lake Improvement and Management (LIM) Committee in 2000 to sponsor an environmental stewardship program to improve and maintain the quality of Countryside Lake. CLA established a water sampling program in 2002. (See Figure 1 in Appendix A.) This program was managed by the LIM water quality sub-committee. The objective of the water sampling program was to establish a water quality baseline and monitor potential water quality impacts and fluctuations/trends as the watershed and area was expected to develop over time. The water quality characterization was also intended to serve as a database to plan strategic improvements and maintain the water quality of Countryside Lake as part of a comprehensive stewardship program.

The lake outlet and four lake inlets were monitored initially by grabbing samples during storm events. This approach was quickly recognized to be inconvenient, erratic and unreliable to collect representative samples from storm event runoff. The grab sample method did allow CLA to learn about the potential flow volumes and water quality impacts from each of the major inlets to the lake. Comparison of the early inlet and outlet water quality also generally revealed how much nutrient impact was imposed and being absorbed by the Lake.

In 2003, CLA purchased seven (7) used ISCO water samplers from the Milwaukee Metropolitan Sewage District for $200. An additional seven sampler heads (mechanical apparatus) accompanied the purchase. Although the sampler housings were generally functional, many of the sampling heads were non-functional and derelict. From the extra heads and much ingenuity and perseverance, one of the volunteers was able to set up five functioning samplers. The samplers were made capable to partition sample every half hour across storm events and collect a single composite sample for each storm event. None of the early samplers were equipped to collect sequential samples across a rain event. This same volunteer developed a telecommunications trigger system that allowed each sampler to be triggered remotely with the vibration feature from a pager. An “on lake” weather station was used to monitor and notify a volunteer when an event occurred.

In 2004 following the development of two years of background water quality data, significantly deteriorated water quality observations and trends began to develop. LIM observed heavy sediment flow into Indian Creek and Countryside Lake during a December 7, 2004 storm event. The results of this storm event were reported to LCHD-LMU and Illinois EPA. Heavy sediment transport continued over the next two years with storm events having magnitudes above 0.5 inches and intensities greater than 0.25 inches per hour causing heavy sediment transport.

## 1.4 Purpose of Project

The grant program implemented by CLA in summer 2007 allowed CLA to improve and upgrade selected sampler equipment and system operations associated with lake inlet and outlet water quality monitoring. The purpose and function of each grant improvement is described below.

CLA purchased two new Model 6712 ISCO Samplers. The new samplers included magazine carriers for sequential sample bottles. This feature vastly improved the sample collection convenience and sample integrity. Previously the individual sampler bottles were separately handled in the field. Sampler performance and reliability was also improved. One new sampler was deployed at sampler location #5 at the Chevy Chase culvert. Sampler #4 at the Gilmer Road culvert was upgraded to a sequential sampler. The remaining Model 6712 ISCO sampler was held as a backup for either sampler, as needed.

A Solinst automatic levellogger was deployed near the culvert inlet at Gilmer Road to measure water elevation (head pressure) on the culvert so that a general time dependent flow measurement was possible. This culvert is partially affected by downstream riffle pools that impose outlet control conditions on the culvert for low flow events. Flow measurements have allowed crude estimates of sediment mass transport in conjunction with TSS and turbidity data measurement. None of the grant funding was used for the levellogger purchase. In 2008, Gilmer Road culvert improvement construction destroyed the Solinst Levellogger sensors which were used as water level flowmeters at this location.

The culvert collapse that occurred in 2009 at Chevy Chase Road was also repaired in summer 2009. These sensors will be replaced with an improved Marsh McBirney Flotote 3 (level and velocity) flowmeter capability purchased in June 2009. The new flowmeter will be installed in 2010 when the culvert improvements are completed. This new flow measuring capability will overcome the problems associated with plugged inlet grates and outlet flow control caused by the downstream riffle pools. The Flotote 3 flowmeter can be adapted to both the Chevy Chase and Gilmer Road culverts.

A LaMott Model 200C turbidity meter was purchased. The turbidity meter is used to assess and screen sediment concentrations in each of the sequential samples so that appropriate compositing of samples is accomplished to reflect representative water quality from the storm event. Initially, all sequential samples from each event were subjected to TSS testing to determine a correlation between TSS and turbidity. With the correlation available, only the composite sample from each event is now tested for TSS. The correlation also allows a crude estimate of sediment mass transport for each rain event. The turbidity meter was not purchased with 319 funding.
New weather station software was also purchased and is now part of a major weather network of stations. The new software has a Doppler radar feature that allows a better prediction of storm rainfall intensity and magnitude. The weather station software was not purchased with 319 funding.

The data collected from the new equipment and system operation is included in this report and was included in previous reports to Illinois EPA as well.

# 2.0 Approaches, Techniques and Methods

The data collected in 2002 and 2003 was sourced using grab sample methods and found to be inconvenient and not as representative as samples generated by the automatic samplers.

As previously described, the monitoring program, since 2007, consists of five (5) samplers. Four are deployed at lake inlets and one at the lake outlet (in the spillway pool). Due to construction, the Donohoe sampler was not operated over the grant period. The sampling program has evolved over time with various equipment maintenance, repairs and replacements. A brief description of the deployments and equipment is described below:

## 2.1 ISCO Sampler Deployments by Location

Model 2700s were originally positioned at Chevy Chase (# 5), Donahoe inlet (# 1), Larsen inlet (# 2), Liberacki inlet (# 3), and the Dam Spillway. All of those sites had AC power available.

The Chevy Chase Model 2700 (# 5) was replaced with a 1680 unit which was battery powered with a solar panel in 2005 and relocated so the intake hose was in the direct flow of the culvert current somewhat further downstream. The 1680 was replaced with a new 6712 at the beginning of the 2008 season.

Changes of the drainage pattern at Donahoe's residence (# 1) from new construction together with dry weather combined to make it nearly impossible to place a pickup hose where it would remain under water in a meaningful location. After relocating the hose perhaps a half-dozen times, we gave up and stopped sampling at that inlet during 2007.

The Larsen Model 2700 (# 2) has remained at its original location to date.

The Liberacki Model 2700 (# 3) expired at the end of the 2004 season. The control head was replaced with a 3700 control head purchased on line. The 3700 unit remained at Liberacki's residence until it was converted to a sequential sampler at the beginning of the 2008 season. It was replaced by the former Donahoe Model 2700.

In September 2004, the Spillway unit battery was dead for the second time due to the GFI on the AC outlet. A solar panel was installed on the sampler to eliminate the need for AC power. Since the ISCO was no longer tethered to the outlet, it was relocated to a platform on top of the spillway where it could take samples more representative of the water passing over the spillway. The sampler was moved from the spillway to the pool culvert about two years ago to provide samples of water that had actually passed the spillway.

Sampling began at Gilmer with a Model 2700 unit but that was changed to a 1680 unit in May of 2006. In February 2008, a Model 3700 composite sampler was converted for sequential use for installation at Gilmer. The retrofit was used in lieu of one of the new 6712s due to concern about possible theft or vandalism. The retrofit set up was less valuable than the new Model 6712. The two new 6712s were assembled and programmed to CLA parameters. One was installed at Chevy Chase, the other was shelved for a sequential sampler backup.

The current deployments are: Gilmer – Model 3700 sequential; Chevy Chase – Model 6712 sequential and Larsen, Liberacki, and Spillway – all Model 2700 composites. We have in reserve one new 6712 sequential and one working 2700 composite. The Model 6712 units were purchased under the grant. All of the samplers are deployed in stream channels or near hydraulic structures where flow monitoring and sediment mass transport estimates may be possible in the future. Samplers # 4 and # 5 are deployed in series on Indian Creek to assess water quality differences between two points along this main stem inlet. The noted differences in water quality may be caused by various natural wetlands and detention pools that are positioned in or adjacent to the stream bed. Sampler # 4 and # 5 have been sequential models since 2008. Photographs and captions are included in Appendix A that depict the samplers.

The **weather station** has evolved through different website and software vendors over the years. The current vendor and CLA weather data station is located at:

http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KILMUNDE4

The station and website is used to collect and archive data for each storm event. The weather data is associated with the water quality data for each storm event. The weather data is also published on a real time basis to the CLA website. Data is also stored for archive retrieval, if desired, by the association membership. Prior to each significant storm event, the weather station is monitored and may trigger an auto-dialer according to rainfall measurements or be used for information to manually trigger the samplers, if rainfall intensity forecasts based on Doppler radar appear to be sufficient for an advance trigger. The current automatic triggers are set at 3/8 inch precipitation magnitude in one hour or ¾ inch in 24 hrs projected storm intensity and magnitude. More detail on the latest trigger strategy is described below:

From May 2008 to July 2009, The Model 100 monitor went on line 24/7 with automatic pager dialing for the 3/8” of rainfall in one hour parameter. The 3/4” total precipitation in a twenty four hour period still had to be tracked manually.

In July 2009, CLA received seven new Sun Flex pagers from USA Mobility (our new service provider) and a notice that our Motorola Bravos must be returned. The transmission frequency that the Bravos units used was being discontinued. This was catastrophic news because our entire automatic system depended on the operation of a feature unique to the Bravo – a slide switch for selecting the vibration mode. We were forced to operate manually while trying to get replacement pagers with the two critical features necessary for our system – default vibration mode and 'reminder' off.

After 6 more batches of pagers had been received, tested, and returned, and over four weeks had passed, we were finally provided with Sun Flex pagers that had been programmed to meet the two requirements. The pagers still had to be modified by bringing vibrator motor and battery power leads out through the cases for connection to our power and control circuits. After several more hectic hours the modifications were finished and the automatic system was again operational in automatic mode.

Starting October 2009, new Model 100 software that tracks both 3/8" precipitation in one hour or 3/4" precipitation in a twenty-four hour period went on line. The system now runs unattended 24/7 and dials the control pagers automatically if either parameter is met.

After triggering, the sequential subsamples are collected every ½ hour for 12 to 13 hours. Both sequential and composite samples are collected at this frequency. Ultimately, 24 bottles in sequential samplers are filled or 24 contributions to a composite sample are collected depending on the sampler capabilities.

Samples are recovered from the samplers at least 13.5 hours after the initial trigger time or longer (but less than 24 hours) for convenience of the volunteers. The trigger mechanism to start the sampling sequence is accomplished with the vibration feature on new Sun Flex pagers that have recently been programmed and installed. After an event, samples are collected and transported to the Project Manager's home where samples are prescreened by turbidity analysis and prepared for shipment. The sequential sample bottles have about 12 ounce capacity and are filed about ¾ full. The composite sample jugs are filled with about 8-10 ounces from each of the sampling intervals and include about two gallons total for each composite sampler. The turbidity is measured in each sequential and composite sample. A magnetic stirrer is used to keep the sediment in suspension.

From the sequential sampler, the turbidity measurements are used to select the sequential samples from which the composite sample for that event will be composed. The selection is made from the highest to lowest turbidity level samples until enough sample volume is obtained for laboratory analysis. Usually the top 2 to 3 samples in turbidity concentration measurement make up the composite sample for the sequential sampler. The method of determining the composition of the composite sample is documented for each event. All of the samples are then packaged for pickup by a commercial laboratory. Photographs and captions are included in Appendix A that illustrate the sample handling process.

The composite water samples from each sampler are tested for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Organic Carbon (TOC). These water quality parameters were selected under the advice of LMU to assess water inflow quality as impacted by erosion and sediment transport and associated nutrient impacts particularly from phosphorus, the limiting nutrient for a “hyper-eutrophic” lake. Water quality standards are also recommended for TSS and TP. The water quality analysis is conducted by Genapure (formerly USBio). Pickup is arranged on the day of collection. After analysis, data is transmitted to LIM and added to the database along with the storm event data.

Although CLA has been successful in its efforts to quantify water quality conditions, the sediment levels were so heavy that it also became interested in quantifying the sediments volumes (weights) in the stormwater flow. This was accomplished with automatic water level recording devices. Solinst Levelogger was initially selected for this application. The levellogger was positioned at the upstream inlet for culvert at Gilmer Road. The levellogger elevation was referenced to the invert of the culvert. The plan was to estimate the flow rate from “inlet control” computations. During heavy sediment transport (up to 6 inches of sediment deposition), riffle pools began to form. Riffle pools developed and were located downstream of the culvert. These pools created significant backwater effects at Gilmer Road causing the culvert to be controlled by “outlet conditions” at low flows rather than ‘inlet conditions’. The Gilmer Road culvert inlet is also subject to severe clogging due to heavy debris transport associated with stream bank deterioration and grading. Most recently, the corrosion and heavy flows at the Chevy Chase corrugated metal pipe culvert caused a culvert collapse in winter 2008. With the many challenging issues associated with the above events, the success of the flow measurement approach has not been consistent. The Solinst Levellogger at Gilmer Road was damaged and lost with the culvert improvement during grading and construction in spring 2008.

# 3.0 Observations and Data Products

### 3.1 Water Quality Data Trends and Observations on Indian Creek Upstream of Countryside Lake

The water quality data trends associated with samplers # 4 and # 5 on Indian Creek are best described in the data summaries presented in the Appendix. This data base was regularly shared with regulation and enforcement agencies during the period of non-compliance with HWCC. Indian Creek represents almost 70 to 80 % of the total flow volume to Countryside Lake.

Some of the major water quality observations and trends for Indian Creek water quality flowing to Countryside Lake include:

- The 2002 and 2003 background TSS data for the Indian Creek monitoring stations was much lower than the 2004 through 2007 data which was elevated by the HWCC project. Levels now appear to be declining in response to the slower construction development activity in 2007 through June 2009. Nonetheless, the recent levels are well above Appendix O levels recommended under the Amended Lake County Watershed Development Ordinance which are set at 120% of the recommended water quality standard established by LMU in 2000
- The water quality conditions measured at Gilmer Road have been consistently about 100% higher than the water quality measured at Chevy Chase Road for all but 2009 TSS data through June.
- A seven (7) point moving average trend line illustrates the significant water quality impacts in 2004 and 2005 with lesser impacts in 2007 and 2008.
- The 2002 and 2003 background phosphorus data for the Indian Creek monitoring stations was much lower than the 2004 through 2007 data which was elevated 200 to 300 % by the HWCC project above 2002 and 2003 background levels. Levels now appear to be declining in response to the slower construction development activity in 2007 through June 2009.
- A seven (7) point moving average trend line illustrates a major spike of phosphorus from the HWCC project occurred in 2006. This spike was likely sourced from re-vegetation efforts and probable use of phosphorous fertilizer.
- Both TSS and TP results appear to be highly correlated which is consistent with LMU's opinion that much of the phosphorus is likely sourced from clay soils native to the region which are associated with sediment transport.
- Total organic carbon levels were also slightly correlated to the other measured water quality parameters but are generally unremarkable.

### 3.2 Monitoring Assistance to Enforcement Agencies

Immediately following the discovery of sediment pollution in Indian Creek and Countryside Lake in December 2004, CLA responded by adding an extra Model1680 ISCO Sequential automatic water sampler to its existing water quality sampling program. The new monitor was located on the east side of the Gilmer Road. culvert and immediately downstream of the Toll Brothers Hawthorn Woods County Club Development (HWCC) offsite discharge into Indian Creek. This station was a sequential sampler to allow partitioning of the water quality impacts across the storm duration. Farther downstream on Indian Creek, the Chevy Chase Sampler (#5) was replaced with a similar sampler. Both of these samplers were purchased as used equipment outside of Illinois EPA funding. The partitioned samples are collected and measured for turbidity. To understand the storm impacts, a representative sample is composited for evaluation of other water quality parameters. Full documentation of the composite technique for each sample is documented.

Although 2005 was a low precipitation year (compared to average), seven (7) storm events were determined to have discharged water quality above a 100 TSS standard. The total phosphorous was also determined to be well above the levels measured from other inlets/inflows to Countryside Lake. Selected results of those storm events are listed below:

Water Quality Impacts at the Gilmer Road Culvert representative of Toll Brothers Offsite Discharges in 2005 are presented below:

| Date | Total Suspended Solids (TSS) (mg/l) | Total Phosphorous (TP) (mg/l) |
|---|---|---|
| May 12, 2005 | 510 | 0.36 |
| May 20, 2005 | 270 | 0.19 |
| June 26, 2005 | 200 | 0.18 - 0.50 |
| July 4, 2005 | 170 | 0.17 – 0.43 |
| July 20, 2005 | 3400 | 0.44 – 1.6 |
| August 18, 2005 | 500 | 0.52 |
| November 28,2005 | 370 | 0.48 |

The average concentration of the Gilmer Road culvert water quality for TSS and TP was 520 % and 270% higher, respectively, above the average water quality of all other inlets for Countryside Lake which are also tributary to other upstream residential subdivisions. Comparing the Gilmer Road water quality to average water quality in Countryside Lake on the same sampling dates, the levels were 2700% and 720% higher, respectively, for TSS and TP.

The changing trends and significant non-compliance events during 2005 and 2006 were all reported to the LMU, Illinois EPA and also Toll Brothers, the upstream residential developer of the Hawthorn Woods Country Club (HWCC) where over 600 homes and golf course were under construction on a 670 acre contiguous parcel. Most of the HWCC development drains into Indian Creek at the upper-most headwaters. Attempts were made by LIM to have the developer enforce the Stormwater Management Plan (erosion and sediment control). Ultimately, the Stormwater Management Commission (SMC) of Lake County and Illinois EPA filed multiple water quality and permit violations against the developer. Illinois EPA ultimately referred the continuing Toll Brothers violations case to the Illinois Attorney General. Most of the developer's abatement efforts were never sufficiently productive to stop the sediment transport until 2006 and 2007 when the developer began to control sediment transport with better re-vegetation of the newly graded development. LIM assisted the Attorney General's Office throughout the HWCC settlement negotiations.

Some of the major events before and during the period of HWCC non-compliance are described below:

| | |
|---|---|
| CLA letter to Village of Hawthorn Woods with questions and concerns about the potential environmental impact of the HWCC to Countryside Lake. | November 28, 2001 |
| CLA attends Hawthorn Woods Commission meeting to address concerns. | December 6, 2001 |
| CLA letter to Toll Brothers with questions and concerns about the potential impact of the HWCC to Countryside Lake. | December 7, 2001 |
| CLA and STS Consultants initial meeting with Lake County Stormwater Management Commission (LCSMC), Toll Brothers and Manhard, Engineer, to discuss questions and concerns. | January 15, 2002 |
| CLA initiates water sampling program. | June, 2002 |
| CLA and STS second meeting with Toll Brothers, LCSMC to discuss questions and concerns. | December 18, 2002 |
| Rain event and CLA notification to LCHD LMU and IEPA of high turbidity coming from HWCC down Indian Creek to Countryside Lake. LCHD LMU and IEPA investigate HWCC as a result of rain event and document water quality violations. | December 7, 2004 |
| CLA letter to Toll Brothers with questions and concerns requesting update and a review meeting. | December 10, 2004 |
| CLA initiates a series of meetings with Toll Brothers and their representatives between February 15 and September 7, 2005 in an attempt to reach an understanding on several technical and legal issues. | February 15, 2005 |
| LCSMC issues violation notice to Toll Brothers. | March 28, 2005 |
| Toll verbally agrees to monitoring station with shared results to CLA. Toll verbally agrees to install augmentation well for CLA. Toll verbally agrees to install temporary settlement basin on Indian Creek. None of the Toll data was ever shared with CLA and none of the performance promises were kept. | April 13, 2005 |
| CLA and STS meet with Toll, Manhard Consulting, LC SMC, and IDOT to review temporary settlement basin concept which Toll verbally agrees to pursue. | April 19, 2005 |
| Special Amendment is made by Toll IL HWCC, L.P. which prohibits the use of fertilizers containing phosphorous on any portion of the Premises. | May 11, 2005 |
| Meeting between CLA and Toll Brothers; Toll reneges on prior commitments and refuses to enter into agreement with CLA. | September 7, 2005 |
| Attorney General complaint filed against Toll | October 13, 2006 |

| | |
|---|---|
| Consent Order filed against Toll including $100K Supplemental Environmental Project (SEP) to CLA | October 9, 2008 |
| CLA $100K SEP sent to Lake County State's Attorney and Attorney General | November 2008 |
| Lake County State's Attorney issues $100K SEP check to CLA | January 15, 2009 |

Portions of the HWCC remain undeveloped and more water quality impacts may occur in the future if proper erosion and sediment control measures are not implemented. HWCC also spray irrigates its wastewater treatment effluent on common grounds and the golf course. This effluent contains high nutrient concentrations.

### 3.3 Comparison of the Water Quality between Inlets to Countryside Lake

- The average concentrations for TSS over the period of record storm events are ranked from worst to better as follows: (1) Gilmer Rd average concentration = 338 mg/l, (2) Chevy Chase average concentration =190 mg/l, (3) Donohoe drain average concentration = 84 mg/l, (4) Larsen drain average concentration = 78 mg/l, (5) Liberacki drain average concentration = 62 mg/l and (6) Dam spillway average concentration = 16 mg/l (without one anomalous event).
- From the above results and rankings, it appears that Indian Creek and the TSS sediment transport are significant contributors to sediment accumulation in Countryside Lake. The TSS sediment reduction between Gilmer Rd. and Chevy Chase Rd. suggest that sediment is also depositing between these sampling points in series on Indian Creek. The data also suggests that the lake treats about 90 to 95% of the TSS discharge from the HWCC.
- The average concentrations for Total Phosphorus (TP) over the period of record storm events are ranked from worst to better as follows: (1) Gilmer Rd average concentration = 0.33 mg/l, (2) Larsen drain average concentration = 0.33 mg/l, (3) Donohoe drain average concentration = 0.26 mg/l, (4) Chevy Chase average concentration = 0.21 mg/l, (5) Liberacki drain average concentration = 0.11 mg/l and (6) Dam spillway average concentration = 0.06 mg/l.
- From the above results and rankings, it appears that Indian Creek and the Total Phosphorus (TP) concentrations detected there are probably the largest mass source of TP to the lake. The TP concentrations are similar at Larsen drain but the flow volumes are much smaller. The concentration difference between Gilmer Rd. and Chevy Chase Rd. suggest that like TSS, the sedimentation or wetlands along Indian Creek may be treating the Indian Creek water quality condition. The high TP concentrations sourced at Donohoe and Larsen drains are likely sourced from lawn fertilizer use in the watershed from mature residential development. In response to these observations, phosphorus free fertilizer use is now mandated by ordinance for the CLA subdivisions. The cleaner water quality from the Liberacki drain is attributed to side channel wetland treatment before entering the lake.
- Phosphorus levels both before, during and after the HWCC project development have consistently exceeded the 0.05 mg/l Phosphorus Water Quality Standard (PWQS). During the major period of water quality impact from the HWCC project, phosphorus levels exceeded the recommended water quality standard by over 2000% during at least four major storm events with an average exceedance level about

700% over the PWQS. The background levels for the other lake inlets have average TP concentrations only about 500% over the water quality standard.

### 3.4 Flow and Time of Concentration Observations

- The period of high TSS water quality concentrations (and likely phosphorus as well) generally occur about one hour following peak storm intensities when flow levels are highest. The measured turbidity and TSS levels decline substantially about 5 to 7 hours following the peak concentration as determined by collected flow data.. Correlations have been developed between TSS vs. turbidity and TP vs. TSS. These correlations are presented in Raw Water Quality data in the Appendix.
- A strong correlation between storm intensity and magnitude appears to drive the level of TSS and TP measured. This correlation is presented in Raw Water Quality data in the Appendix.

# 4.0 Summary Conclusions and Benefits

The LMU County Lake Water Quality Testing Program has been a great leadership program to CLA and other lake associations in Lake County. The LMU program has promoted a deep understanding within CLA about the lake condition and measures to improve lake water quality. The LMU staff has also supported CLA through its dilemma with the HWCC project. LMU leadership has been the catalyst for CLA stewardship toward the lake and its ecology.

This grant project has been possible only with the knowledge and commitment extended by the CLA and LIM volunteers. The state funding commitment has been much appreciated and has facilitated improved monitoring techniques. LIM expresses gratitude to all who have supported the program.

Water quality observations and trends presented in this report reflect conditions that are likely occurring broadly in our watershed environments. Both the knowledgeable awareness and monitoring activities of CLA were the primary factors in the discovery of the egregious water quality violations occurring at HWCC. These water quality concerns were expressed between the parties before the HWCC project started but the “status quo” approach to erosion and sedimentation control during construction did not raise the level of protection that was needed to protect Countryside Lake and Indian Creek. HWCC repeatedly attempted to rationalize that the water quality impacts were minor. The data continued to tell a different story, particularly when compared to the water quality standards that are promoted to improve water quality and the background conditions measured before the project began. The water quality database and the persistence of enforcement agencies to utilize the data were exemplary. The CLA data contributions to the Attorney General Office aided prosecution of the repeated HWCC violations. The HWCC case settlement also serves as a good example of how stewardship brought awareness to the water quality issue and ultimate protection of the environment.

Although CLA had no particular expectations about its water quality from various inlets, the monitoring results have been useful in ranking the inlets according to water quality standards and indentifying trends. The water quality violations from HWCC were also discovered. Today, water quality from Indian Creek has slightly improved during the last two years due to the slower residential development at HWCC, less earthwork disturbance and improved re-vegetation.

The water quality database for Countryside Lake is a valuable tool to understand the sources of water pollution entering the lake. The database can also be used to identify where water quality improvements should be considered. Any future water quality improvements can also be compared to the historical database to measure the effectiveness of any improvement. The database will continue to provide a measurement of HWCC erosion and sediment control performance as development progresses and track phosphorus discharges from HWCC wastewater spray irrigation on the upstream golf course.

The data included with this report will be forwarded to the Indian Creek Watershed Development Group. CLA is an interested participant with this group. The CLA database represents the first significant water quality data collection in the headwaters of Indian Creek.

# 5.0 Acknowledgments

CLA would like to acknowledge and thank the dedicated volunteers of Countryside Lake without whom we would have had no water monitoring or samples taken. Jim Donndelinger who masterminded and trouble shot all sorts of mechanical/electrical problems with the sampling units and pagers and has spent countless hours working to keep our system running; Brian Donahoe who has kept detailed data and has charted our progress and hosts the weather station on his property; Julie Wilkins and Sidney Czynski who respond at a moment's notice to trigger, retrieve and test the samples during rain events, and also to make sure our samples are uncorrupted as they make their way to the out of state laboratory for testing; posthumously to Bud Furch, for his dedication, passion and desire to keep Countryside Lake healthy, beautiful and viable for future generations. They have selflessly dedicated many hours of their time and effort before this grant started, and will continue long after the grant has been administered.

CLA would also like to extend special thanks and consideration to the Illinois EPA for assisting Countryside Lake Association with the funding of this grant. Special thanks to Scott Tomkins who provided time and patience to novice volunteers, as well as Gregg Good and Michael S. Henebry from Illinois EPA, Chris Kallis from the Illinois EPA DWPC Region 2 Division, Sean Wiedel, AICP, CFM, Watershed Planner for Lake County Stormwater Management Commission; Patty Werner, Lake County Stormwater Management Commission; Mike Adam, Senior Biologist, Lake County Health Department, Mark Pfister, Lake County Health Department, Tori Trauscht, President Indian Creek Watershed Partnership (ICWP Ltd.) , Dan Liberacki, past President Countryside Lake Association, and Doug Hermann, Kevin Kasprzak from AECOM (formerly STS Consultants) whose help has been invaluable in many aspects of this project over the past seven years.

# Appendix A

Figure 1 – Project Location

Photographs and Captions

Raw Water Quality Data Spreadsheets and Turbidity Screening Results and Event Data (recorded and stored on attached DVD only)

PART OF SECTION 26, 27, 34 AND 35,
TOWNSHIP 44 N, RANGE 10 E



X:\PROJECTS\60089645\DWG\G-60086945-Sampler.dwg; 10/22/2009 4:39:58 PM; COX, KAREN; STS.stb

AECOM

847.279.2500
www.aecom.com


SITE LOCATION MAP
COUNTRYSIDE LAKE
NEAR MUNDELEIN, ILLINOIS

| | | |
|---|---|---|
| Drawn : | KLC | 10/22/2009 |
| Checked: | DJH | 10/22/2009 |
| Approved: | DJH | 10/22/2009 |
| PROJECT NUMBER | 60089645 | |
| FIGURE NUMBER | 1 | |

Typical ISCO Model 6712 automatic sampler (#5) installation at Chevy Chase Rd. Note solar panel above sampler.

Isco Model 2700 sampler (# 1) located at the Larsen drain. Note battery pack.

**Isco Model 2700 sampler located at dam spillway and downstream culvert. Note high flow conditions.**

**Example condition of heavy turbidity following storm event located at Gilmer Rd culvert**


**Sequential sampler containers prepared for turbidity testing and sample composite**


**Dilution process for turbidity testing to obtain sample concentrations in turbidity meter range**

| event date | duration hr | total rain inch | max intensity in/hr | max time | start time | total collection | composite vol | NTU | TSS | TOC | Tot Phos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DAM | | | | | | | | | | | |
| 3/31/2008 | 11.00 | 2.58 | 0.30 | 12:00PM | 12:45PM | 13.5 hr | 7.0L | 1.8 | 4.8 | 9.7 | U |
| 4/10/2008 | 12.00 | 1.12 | 0.24 | 3:00PM | 1:30PM | 13.5 hr | 7.0L | 2.7 | 5.6 | 6.1 | U |
| 5/2/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 5/11/2008 | 7.00 | 0.70 | 0.18 | 9:30AM | 8:00AM | 13.5 hr | 7.0L | 5.7 | 12.0 | 7.9 | U |
| 5/26/2008 | 4.50 | 0.87 | 0.85 | 11:30AM | 12:00AM | 13.5 hr | 5.5L | 14.9 | 16.0 | 10.4 | U |
| 6/7/2008 | 1.00 | 0.53 | 0.50 | 8:00PM | 8:00PM | 13.5 hr | 6.5L | 1.3 | 2.3 | 7.4 | U |
| 6/8/2008 | 3.00 | 1.72 | 0.70 | 10:45PM | 9:30PM | 12.0 hr | 5.0L | 3.1 | 3.5 | 7.2 | U |
| 6/13/2008 | 1.00 | 0.78 | 0.50 | 4:30PM | 3:50PM | 13.5 hr | 7.0L | 1.2 | U | 8.2 | U |
| 7/12/2008 | 3.00 | 0.64 | 0.45 | 5:30AM | 5:10AM | 13.5hr | 7L | 4.7 | 12.0 | 11.9 | U |
| 7/19/2008 | 5.00 | 0.75 | 0.35 | 7:00AM | 12:00PM | 13.5hr | 7.0L | 4.4 | 5.8 | 10.0 | U |
| 8/13/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 9/4/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 9/12/2008 | 2.00 | 0.45 | 0.40 | 3.:30PM | 3:15PM | 13.5hr | 7.0L | 12.0 | 25.3 | 11.0 | 0.00957 |
| 9/13/2008 | 5.00 | 2.99 | 0.75 | 6:00AM | 2PM | 13.5hr | 7.0L | 6.0 | 10.6 | 9.2 | U |
| 9/14/2008 | 8.00 | 1.07 | 0.25 | 11:00AM | 12:15pm | 13.5 | 3.0L | 6.0 | 6.7 | 8.5 | U |
| 10/7/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
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| event date | duration hr | total rain inch | max intensity in/hr | max time | start time | total collection | composite vol | NTU | TSS | TOC | Tot Phos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Larson | | | | | | | | | | | |
| 3/31/2008 | 11.00 | 2.58 | 0.30 | 12:00PM | 12:45PM | 13.5 hr | 10.0 L | 10.2 | 8.5 | 6.8 | 0.0496 |
| 4/10/2008 | 12.00 | 1.12 | 0.24 | 3:00PM | 1:30PM | 13.5 hr | 7.0 L | 20.1 | 37.8 | 7.2 | 0.0268 |
| 5/2/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 5/11/2008 | 7.00 | 0.70 | 0.18 | 9:30AM | 8:00AM | 13.5 hr | 5.0 L | 263.0 | 522.0 | 8.3 | 0.1800 |
| 5/26/2008 | 4.50 | 0.87 | 0.85 | 11:30AM | 12:00AM | 13.5 hr | 4.5 L | 107.5 | 247.0 | 9.7 | 0.1110 |
| 6/7/2008 | 1.00 | 0.53 | 0.50 | 8:00PM | 8:00PM | 13.5 hr | 6.0 L | 142.0 | 267.0 | 9.7 | 0.0948 |
| 6/8/2008 | 3.00 | 1.72 | 0.70 | 10:45PM | 9:30PM | 12.0 hr | 5.0 L | 21.1 | 35.9 | 9.7 | U |
| 6/13/2008 | 1.00 | 0.78 | 0.50 | 4:30PM | 3:50PM | 13.5 hr | 6.5 L | 36.8 | 101.0 | 9.0 | U |
| 7/12/2008 | 3.00 | 0.64 | 0.45 | 5:30AM | 5:10AM | 13.5 | 5.5L | 23.7 | 47.0 | 8.9 | U |
| 7/19/2008 | 5.00 | 0.75 | 0.35 | 7:00AM | 12:00PM | 13.5 | 5.5L | 10.6 | 14.1 | 7.0 | U |
| 8/13/2008 | 2.00 | 0.50 | 0.42 | 9:00M | 10:30M | 13.5 | 5.5L | 6.9 | 13.8 | 14.0 | U |
| 9/4/2008 | 5 | 2.87 | 2.87 | 0.60 | 3:45PM | 13.5 | 5.75L | 39.0 | 70.8 | 9.8 | 0.0335 |
| 9/12/2008 | 2.00 | 0.45 | 0.40 | 3.:30PM | 3:15PM | 13.5hr | 5.5L | 25.0 | 45.8 | 8.8 | 0.0234 |
| 9/13/2008 | 5.00 | 2.99 | 0.75 | 6:00AM | 2PM | 13.5hr | 6.0L | 11.0 | 16.1 | 8.3 | 0.0102 |
| 9/14/2008 | 8.00 | 1.07 | 0.25 | 11:00AM | 12:15pm | 13.5 | 5.0L | 10.0 | 12.5 | 8.7 | 0.0174 |
| 10/7/2008 | 8.00 | 0.77 | 0.18 | 8:15PM | 4:00PM | 13.5hr | 6.0L | 27.0 | 38.5 | 6.8 | 0.11 |
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| event date | duration hr | total rain inch | max intensity in/hr | max time | start time | total collection | composite vol | NTU | TSS | TOC | Tot Phos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Liberacki | | | | | | | | | | | |
| | | | | | | | | | | | |
| 3/31/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 4/10/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 5/2/2008 | 2.00 | 0.43 | 0.43 | 11:30AM | 11:10AM | 13.5 hr | 9.5 L | 20.6 | 21.0 | 9.0 | 0.0279 |
| 5/11/2008 | 7.00 | 0.70 | 0.18 | 9:30AM | 8:00AM | 13.5 hr | 9.5 L | 23.5 | 41.2 | 10.6 | 0.0219 |
| 5/26/2008 | 4.50 | 0.87 | 0.85 | 11:30AM | 12:00AM | 13.5 hr | 6.0 L | 29.2 | 38.0 | 10.8 | 0.0400 |
| 6/7/2008 | 1.00 | 0.53 | 0.50 | 8:00PM | 8:00PM | 13.5 hr | 6.0 L | 39.0 | 43.4 | 15.0 | 0.0690 |
| 6/8/2008 | 3.00 | 1.72 | 0.70 | 10:45PM | 9:30PM | 12.0 hr | 5.5 L | 20.4 | 23.1 | 12.3 | U |
| 6/13/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 7/12/2008 | 3.00 | 0.64 | 0.45 | 5:30AM | 5:10AM | 13.5 | 6.0L | 20.6 | 44.6 | 10.6 | 0.0226 |
| 7/19/2008 | 5.00 | 0.75 | 0.35 | 7:00AM | 12:00PM | 13.5 | 6.0L | 5.1 | 7.3 | 10.7 | U |
| 8/13/2008 | 2.00 | 0.50 | 0.42 | 9:00M | 10:30M | 13.5 | 5.5L | 7.4 | 9.5 | 12.0 | U |
| 9/4/2008 | 5 | 2.87 | 2.87 | 0.60 | 3:45PM | 13.5 | 5.0L | 17.0 | 30.7 | 13.0 | 0.0462 |
| 9/12/2008 | XX | XX | XX | XX | XX | XX | XX | | | | |
| 9/13/2008 | 5.00 | 2.99 | 0.75 | 6:00AM | 2PM | 13.5hr | 3L | 10.0 | 12.6 | 9.3 | 0.0139 |
| 9/14/2008 | 8.00 | 1.07 | 0.25 | 11:00AM | 12:15pm | 13.5 | 7L | 8.7 | 10.6 | 12.0 | 0.0135 |
| 10/7/2008 | 8.00 | 0.77 | 0.18 | 8:15PM | 4:00PM | 13.5hr | 6.0L | 16.0 | 20.5 | 10.0 | 0.117 |
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| event date | photo ID | duration hr | total rain inch | max intensity in/hr | additional inlet composite data | max time | Gilmer NTU peak time | peak sample vol | NTU | TSS | TOC | Tot Phos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gilmer | | | | | | | | | | | | |
| 3/31/2008 | yes | 11.0 | 2.58 | 0.30 | Larson,dam | 12:00PM | 1:00PM | 1200ml | 280 | 20 | 5.59 | 0.194 |
| 4/10/2008 | no | 12.0 | 1.12 | 0.24 | larson,dam | 3:00PM | 5:00PM | 1000ml | 386 | 600 | 8.10 | 0.172 |
| 5/2/2008 | yes | 2.0 | 0.43 | 0.43 | liberacki | 11:30AM | 12:25PM | 1200ml | 474 | 365 | 7.51 | 0.210 |
| 5/11/2008 | yes | 7.0 | 0.70 | 0.18 | dam, lars,liberacki | 9:30AM | 11:00AM | 1200ml | 27 | 51 | 10.40 | 0.030 |
| 5/26/2008 | yes | 4.5 | 0.87 | 0.75 | dam, lars,liberacki | 12:30AM | 3:00AM | 1200ml | 158 | 230 | 10.60 | 0.236 |
| 6/7/2008 | yes | 1.0 | 0.53 | 0.50 | dam, lars,liberacki | 8:00PM | 9:00{PM | 1300ml | 242 | 252 | 12.00 | 0.149 |
| 6/8/2008 | yes | 1.5 | 1.72 | 0.50 | | 12:00PM | 12:30PM | 1200ml | 188 | 394 | 13.00 | 0.301 |
| 6/13/2008 | no | 1.0 | 0.78 | 0.50 | dam,larson | 4:30PM | 5:10PM | 1200ml | 351 | 288 | 9.40 | 0.142 |
| 7/12/2008 | no | 3.0 | 0.64 | 0.45 | dam,lars,liberacki | 5:30AM | 5:40AM | 1300ml | 303 | 428 | 11.60 | 0.218 |
| 7/19/2008 | no | 5.0 | 0.75 | 0.35 | dam,lars,liberacki | 7:00AM | 1:00PM | 1300ml | 22.7 | 49.2 | 11.70 | 0.058 |
| 8/13/2008 | no | 2.0 | 0.50 | 0.42 | larson, liberacki | 9:00PM | 11:00PM | 750ml | 190 | 99.3 | U | 0.325 |
| 9/4/2008 | no | 5.0 | 2.87 | 0.60 | larson,liberacki | 7:00PM | 6:45PM | 900 | 800 | 1660 | 20.00 | 0.697 |
| 9/12/2008 | XX | XX | XX | XX | dam,larson | XX | XX | XX | XX | XX | XX | XX |
| 9/13/2008 | no | 5.0 | 2.99 | 0.75 | dam,larson.liberacki | 6:00AM | 3:30PM | 750ml | 33 | 58.7 | 8.80 | 0.105 |
| 9/14/2008 | yes | 8.0 | 1.07 | 0.25 | dam,larson.liberacki | 11:00AM | 2:15PM | 650ml | 17 | 10 | 13.00 | 0.059 |
| 10/7/2008 | yes | 8.0 | 0.77 | 0.18 | larson, liberacki | 8:15PM | 8PM | 650ml | 180 | 421 | 9.60 | 0.639 |
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| event date | photo ID | duration hr | total rain inch | max intensity in/hr | additional inlet composite data | max time | NTU peak time | peak sample vol | NTU | TSS | TOC | Tot Phos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chevy Chase | | | | | | | | | | | | |
| 3/31/2008 | yes | 11.0 | 2.58 | 0.30 | Larson,dam | 12:00PM | 1:30PM | 1000ml | 97.5 | 112 | 6.87 | 0.125 |
| 4/10/2008 | no | 12.0 | 1.12 | 0.24 | larson,dam | 3:00PM | 5:00PM | 1200ml | 151.0 | 178 | 8.65 | 0.133 |
| 5/2/2008 | yes | 2.0 | 0.43 | 0.43 | liberacki | 11:30AM | 2:10PM | 900ml | 71.8 | 103 | 7.61 | 0.059 |
| 5/11/2008 | yes | 7.0 | 0.70 | 0.18 | dam, lars,liberacki | 9:30AM | 9:00AM | 1000ml | 51.1 | 131 | 0.51 | 0.105 |
| 5/26/2008 | yes | 4.5 | 0.87 | 0.75 | dam, lars,liberacki | 12:30AM | 12:30AM | 1000ml | 272.0 | 421 | 10.70 | 0.294 |
| 6/7/2008 | yes | 1.0 | 0.53 | 0.50 | dam, lars,liberacki | 8:00PM | 10:30PM | 800ml | 174.0 | 206 | 11.40 | 0.156 |
| 6/8/208 | yes | 3.0 | 1.72 | 0.70 | dam, lars,liberacki | 10.45PM | 11:30PM | 1000ml | 126.0 | 212 | 11.60 | 0.102 |
| 6/13/2008 | no | 1.0 | 0.78 | 0.50 | dam,larson | 4:30PM | 5:45PM | 900ml | 133.0 | 146 | 9.64 | 0.021 |
| 7/12/2008 | no | 3.0 | 0.64 | 0.45 | dam,lars,liberacki | 5:30AM | 7:00AM | 900ml | 200.0 | 219 | 10.90 | 0.166 |
| 7/19/2008 | no | 5.0 | 0.75 | 0.35 | dam,lars,liberacki | 7:00AM | 1:00PM | 800ml | 17.6 | 35.4 | 12.40 | 0.042 |
| 8/13/2008 | no | 2.0 | 0.50 | 0.42 | larson, liberacki | 9:00PM | 11:30PM | 1100ml | 550.0 | 447 | U | 0.349 |
| 9/4/2008 | no | 5.0 | 2.87 | 0.60 | larson,liberacki | 7:00PM | 11:30PM | 900ml | 65.0 | 98.2 | 9.00 | 0.030 |
| 9/12/2008 | XX | XX | XX | XX | dam,larson | XX | XX | XX | XX | XX | XX | XX |
| 9/13/2008 | no | 5.0 | 2.99 | 0.75 | dam,larson.liberacki | 6:00AM | 9-14noon hand grab | 1L | 14.0 | 11.5 | 9.40 | 0.061 |
| 9/14/2008 | yes | 8.0 | 1.07 | 0.25 | dam,larson.liberacki | 11:00AM | 9-15 noon hand grab | 1L | 16.0 | 11.5 | 9.10 | 0.066 |
| 10/7/2008 | XX | XX | XX | XX | larson, liberacki | XX | XX | XX | XX | XX | XX | XX |
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# Appendix B

2002 through 2009 Water Quality Data Summaries
(recorded on hardcopy here and DVD)

Countryside Lake Association
Mundelien, IL

# Countryside Lake
# Water Data from Indian Creek

# Accumulated results
# As of 7/10/09

Brian Donahoe

7/11/09

Countryside Lake Association
Mundelien, IL

## Overview

There are 18 plots enclosed, the first 6 are for measurements of TSS (Total Suspended Solids). The second 6 are measurements of Phosphorus. And the third 6 are for Total Organic Carbon.

The samples of water used to create the graphs were taken from the Indian Creek sampler, located just east of Gilmer road, and the Chevy Chase sampler, located just west of Chevy Chase road. A diagram is shown on the next page.

The plots are best looked at side by side. They all have the same scale, and the before and after effects are better observed.

***Changes from last report***:

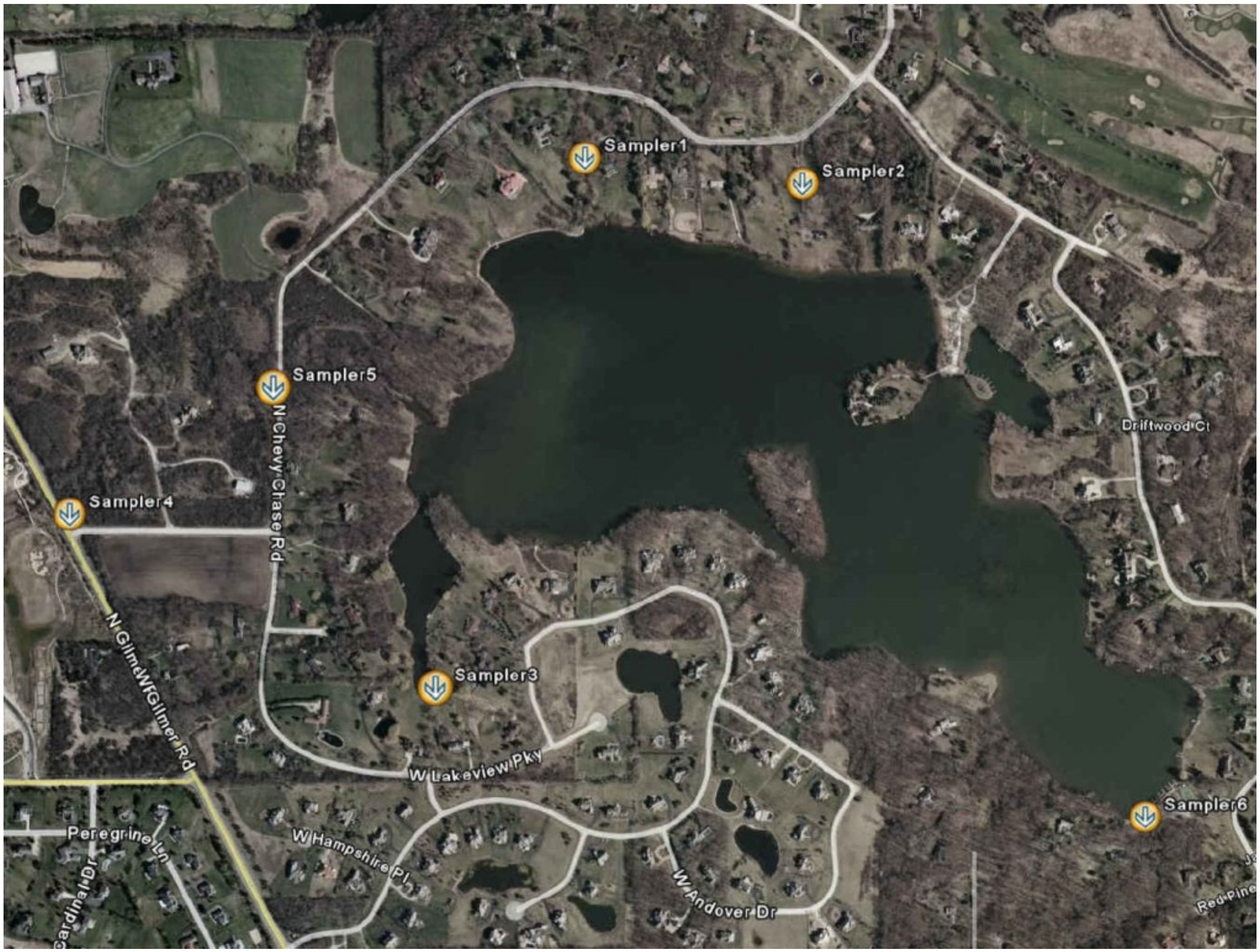
- Completed the 2008 data
- Added the 2009 data to date
- Added Total Organic Carbon Plots
- Added moving averages (in yellow) to reports showing all data
- Updated multi-year charts to reflect thru 2009 data

## Summary

1. New moving averages on plots showing all data, indicate that deposits were worst during Toll construction.
2. Gilmer inlet is significantly violating “Lake County Watershed Development Ordinance”, and the “Water Quality Certification Permit” of IAC Subtitle C Part 302.205. It was worst during Toll construction (2004-2006).
3. Continued trend of Gilmer inlet to Countryside Lake being a significant source of sediments and phosphorus
4. Further evidence accumulated that supports the Toll Construction has adversely increased the amount and concentration of sediments and phosphorus in the Indian Creek feed into Countryside Lake
5. Continued suspicion based on observations that property between Chevy Chase and Gilmer is buffering sediments and phosphorus from upstream, and re-releasing them later.
6. TSS and Phosphorus lower now that major construction is finished.

Countryside Lake Association
Mundelien, IL

Chevy Chase sampler is Sampler 5. Gilmer sampler is Sampler 4.



Countryside Lake Association
Mundelien, IL

# Total Suspended Solids

Regarding TSS (Total Suspended Solids), 2002 and 2003 data (i.e. before Toll construction) is small in comparison to 2004-2007 (i.e. during construction), and values are down again after construction (2008-2009).

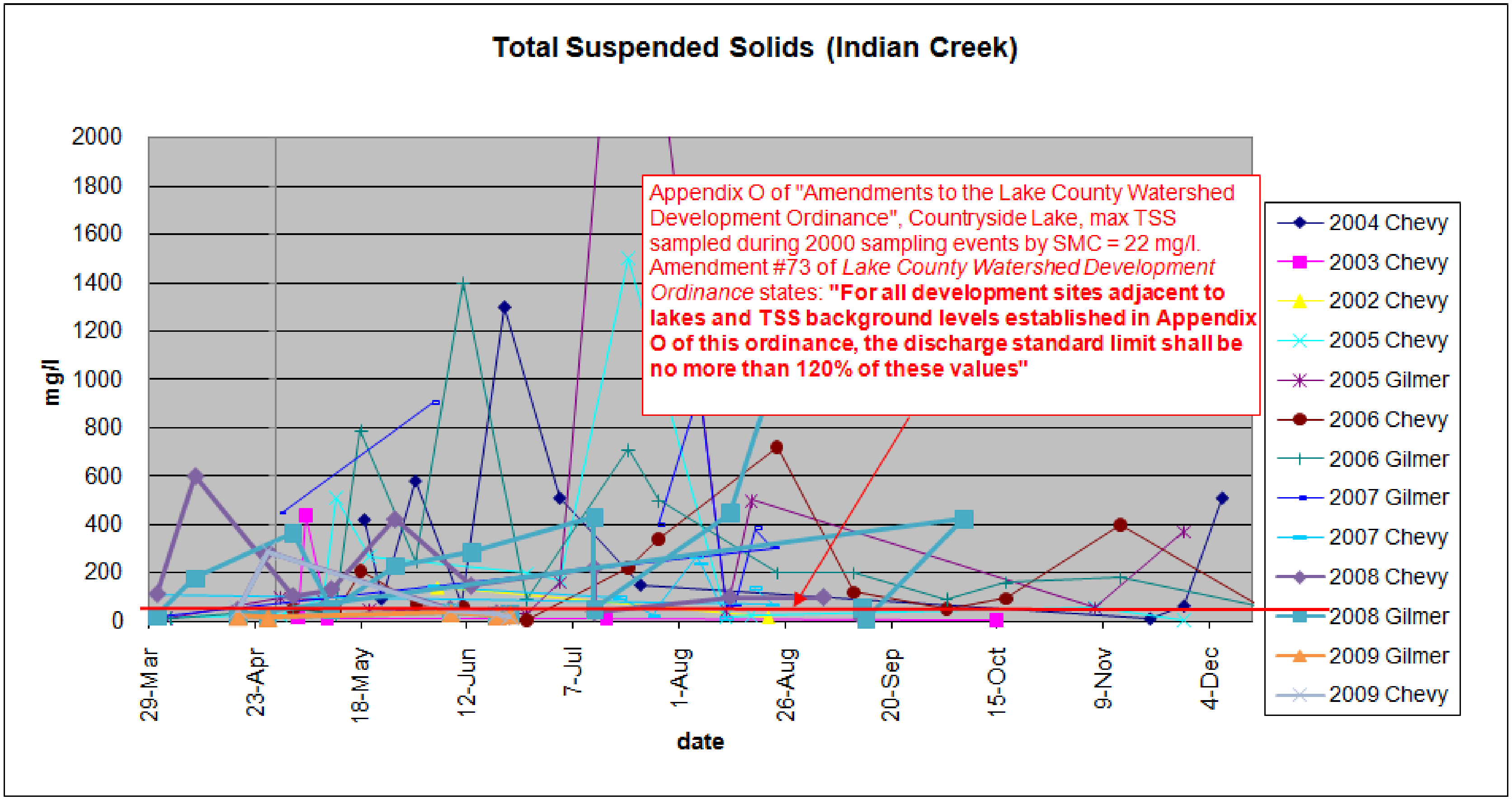



**Figure 1. Year by year comparison of TSS**

Countryside Lake Association
Mundelien, IL

Below are shown all data points distinctly *before* the construction began. Most points were below the standard, and generally consistently low.

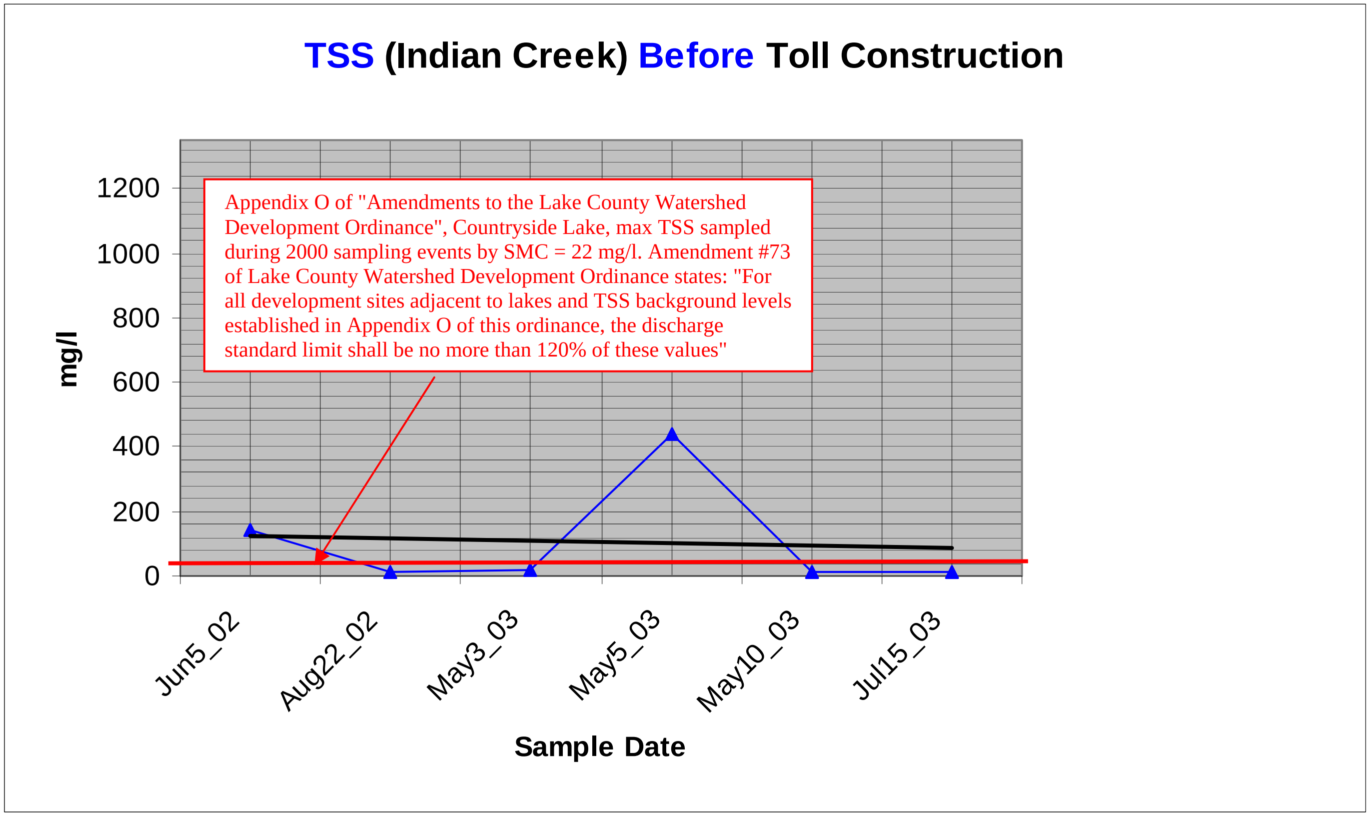



**Figure 2. TSS *Before* Construction**

Countryside Lake Association
Mundelien, IL

Below are shown all data points distinctly *during* the construction. Most points were above the standard, and generally consistently high.

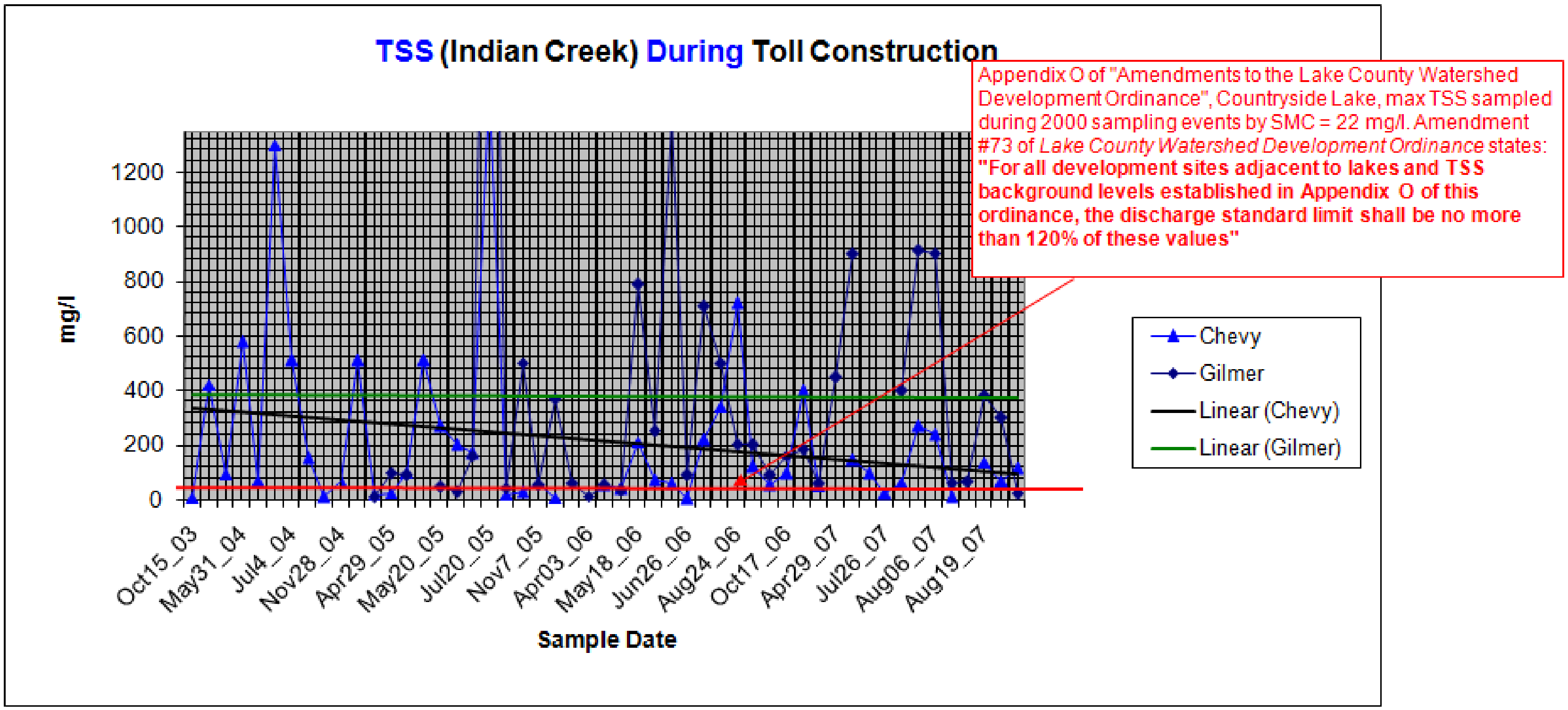



**Figure 3. TSS *During* Construction (2004-2007)**

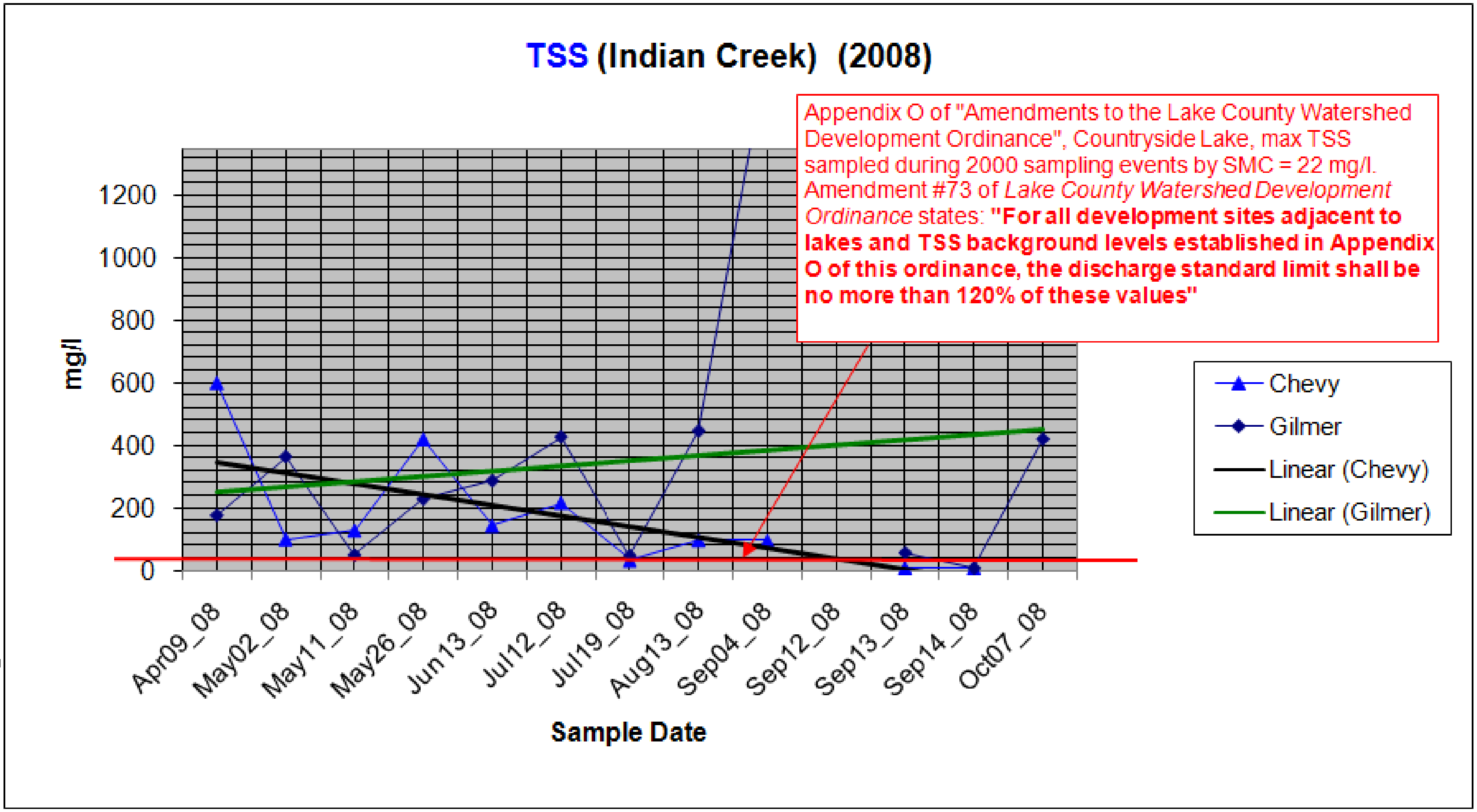



**Figure 4. TSS 2008**

Countryside Lake Association
Mundelien, IL

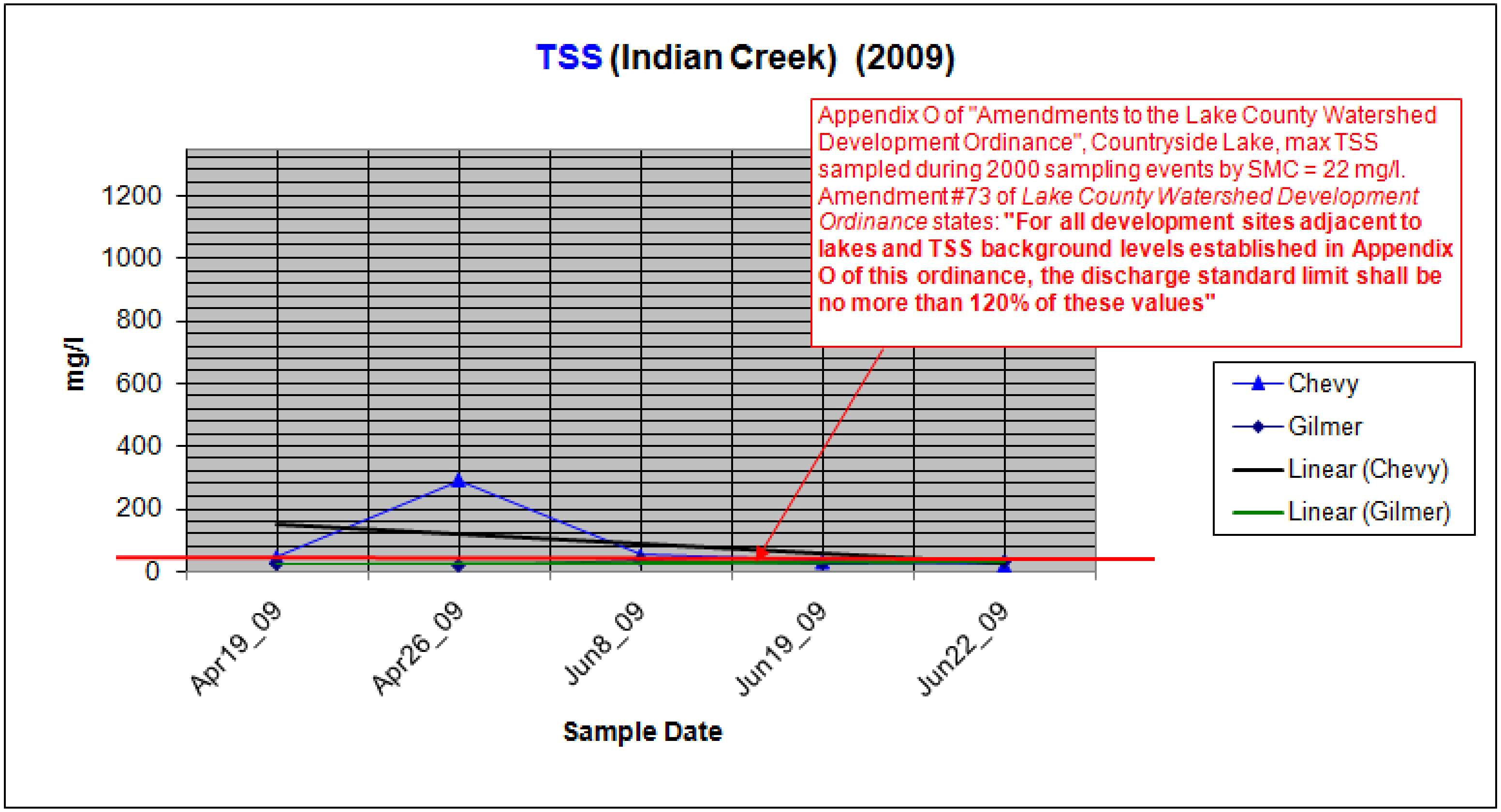



**Figure 5. TSS 2009**

# Countryside Lake Association
Mundelien, IL

The plot below shows the total suspended solids over all time of recorded data for Indian Creek and for Gilmer. The yellow line is new for this report and shows the 7 day moving average.

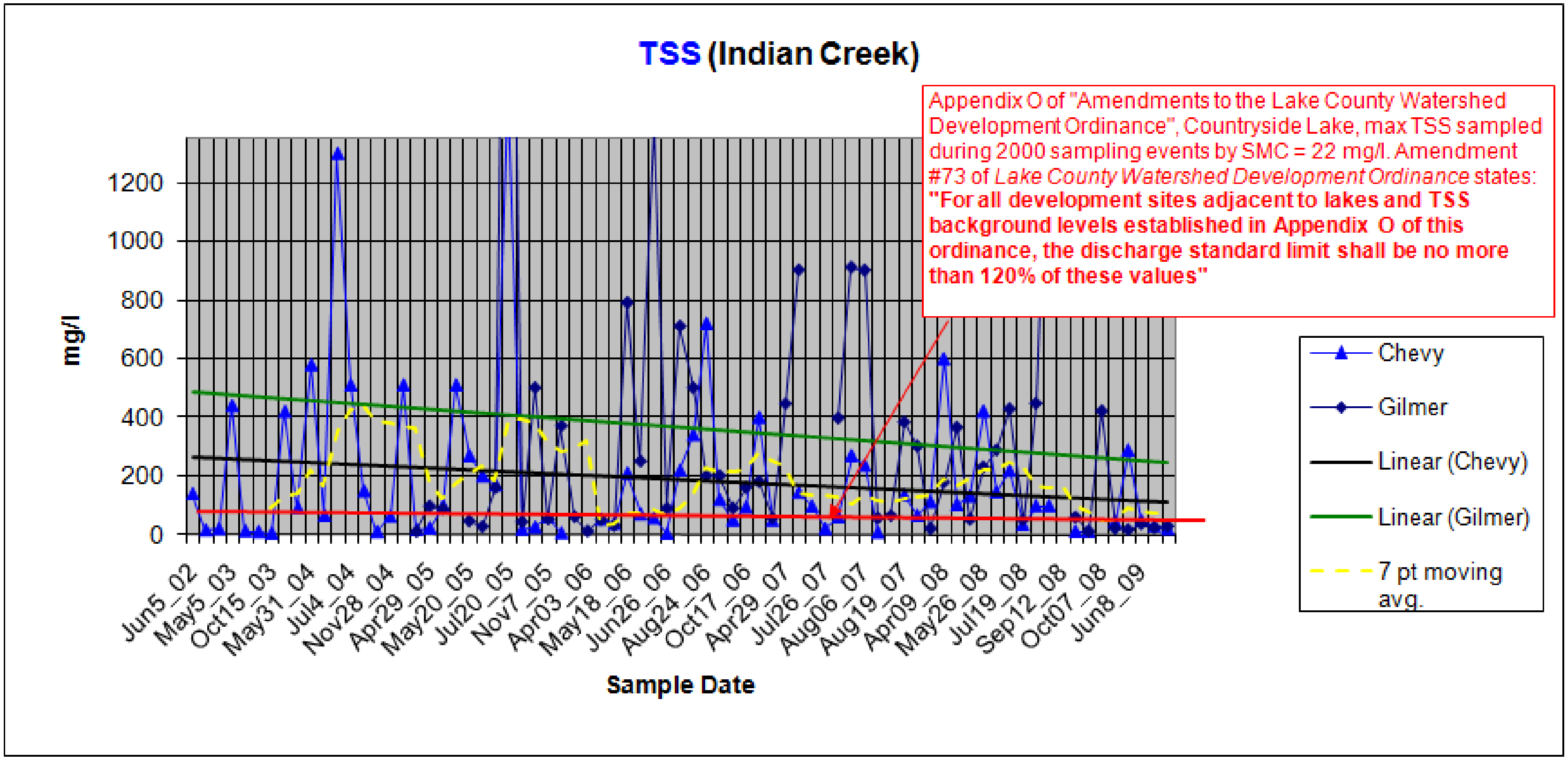



**Figure 6. TSS over all recorded data**

Countryside Lake Association
Mundelien, IL

# Phosphorus

Regarding Phosphorus 2002 and 2003 data (i.e. before construction) is small in comparison to subsequent years (i.e. during construction). It is a low again after construction.

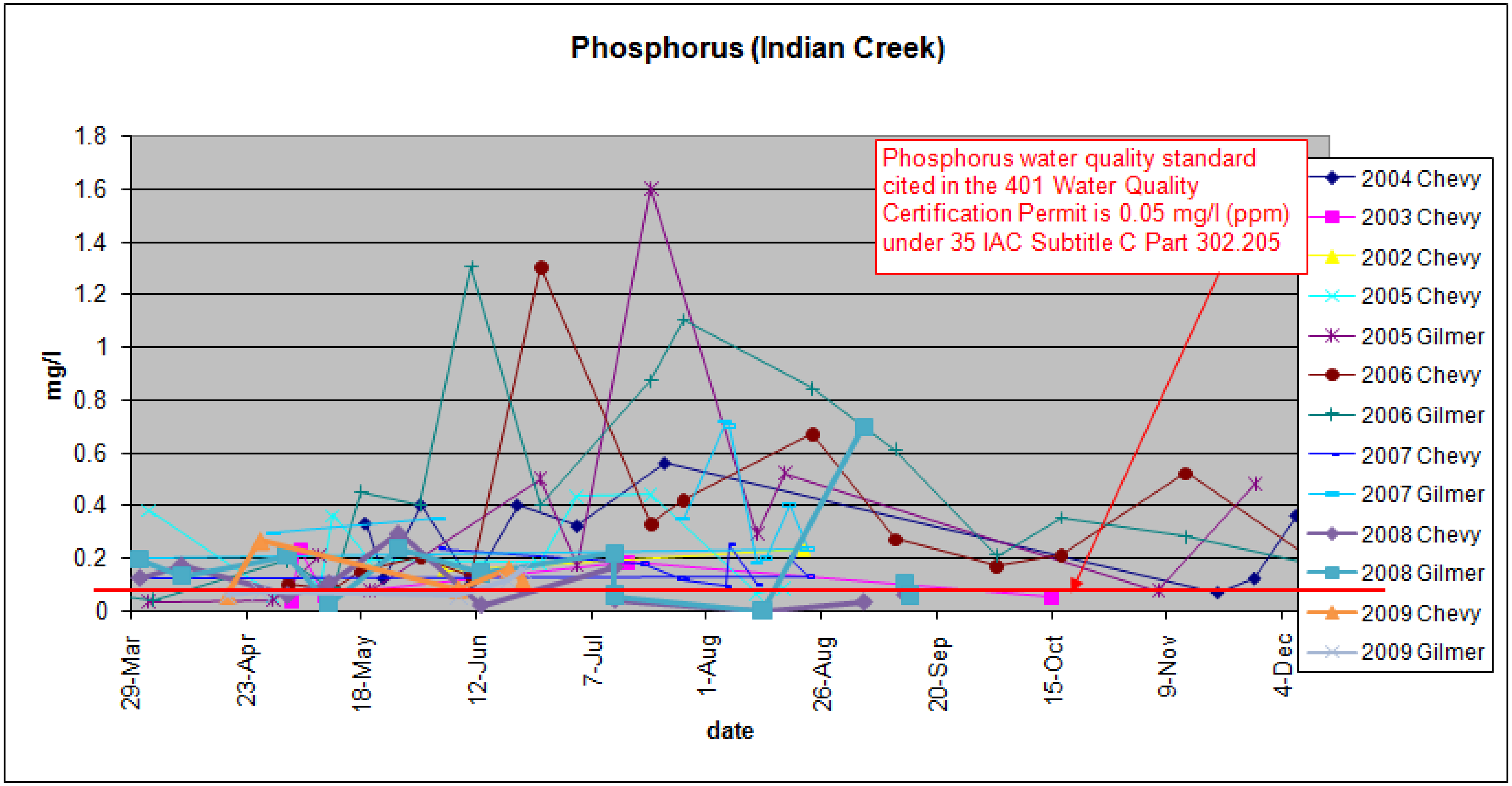



**Figure 7. Year by year comparison of Phosphorus**

Countryside Lake Association
Mundelien, IL

Below are shown all data points distinctly *before* the construction began. Most points were generally low.

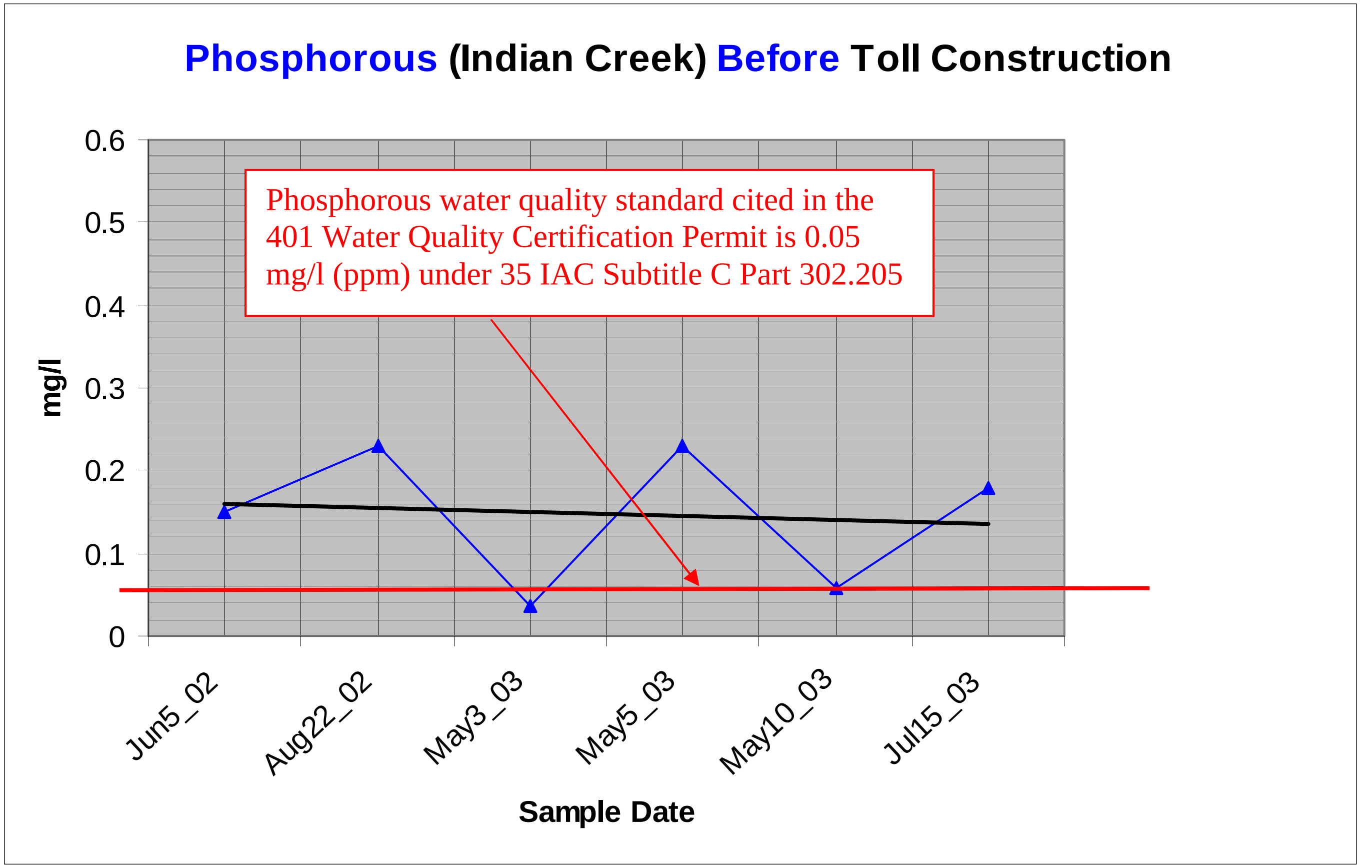



**Figure 8. Phosphorus *Before* Construction**

Below are shown all data points distinctly *after* the construction began. Most points were above the standard, and generally consistently high.

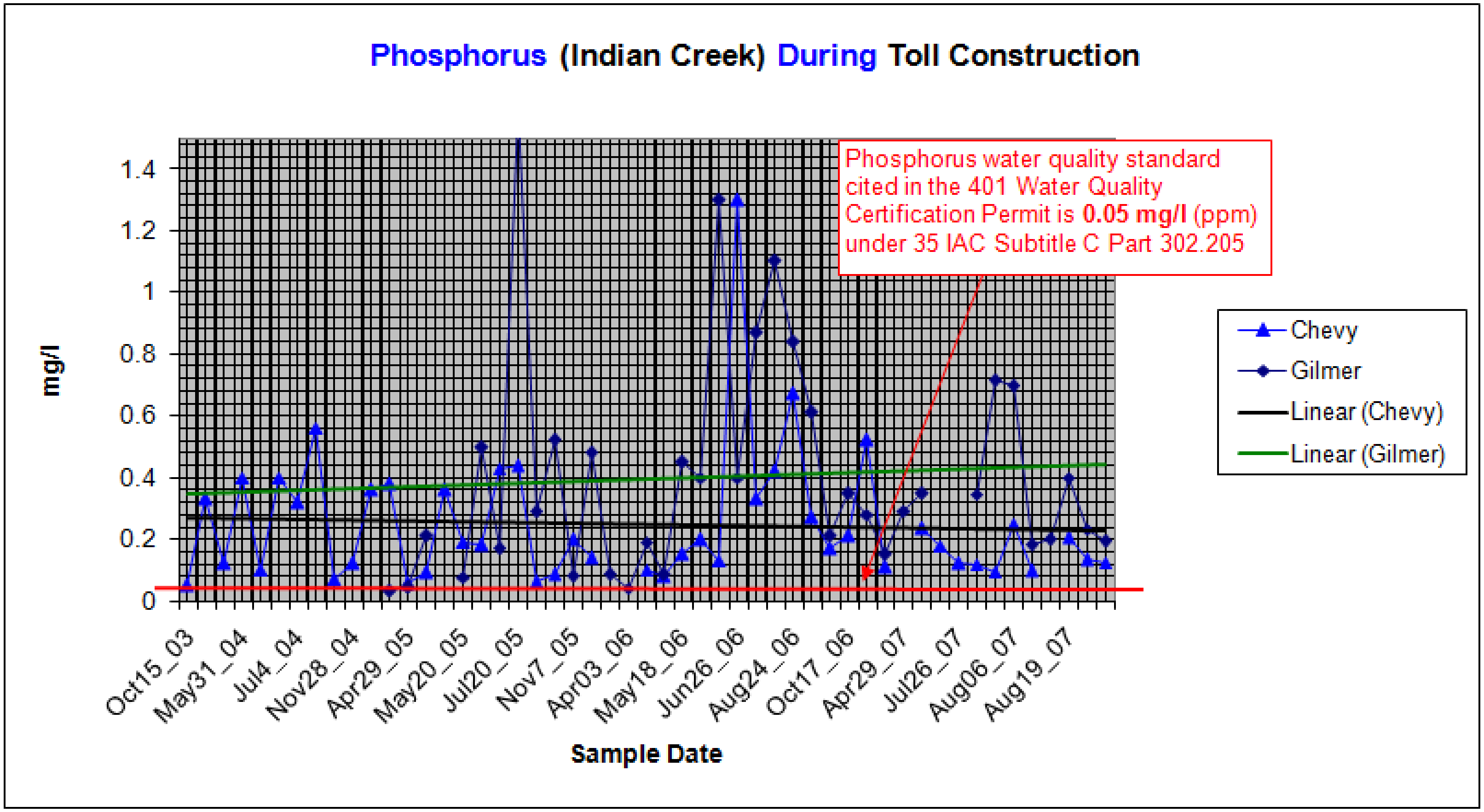



**Figure 9. Phosphorus *During* Construction (2004-2007)**

Countryside Lake Association
Mundelien, IL

Phosphorus is lower than in recent years, as shown below.

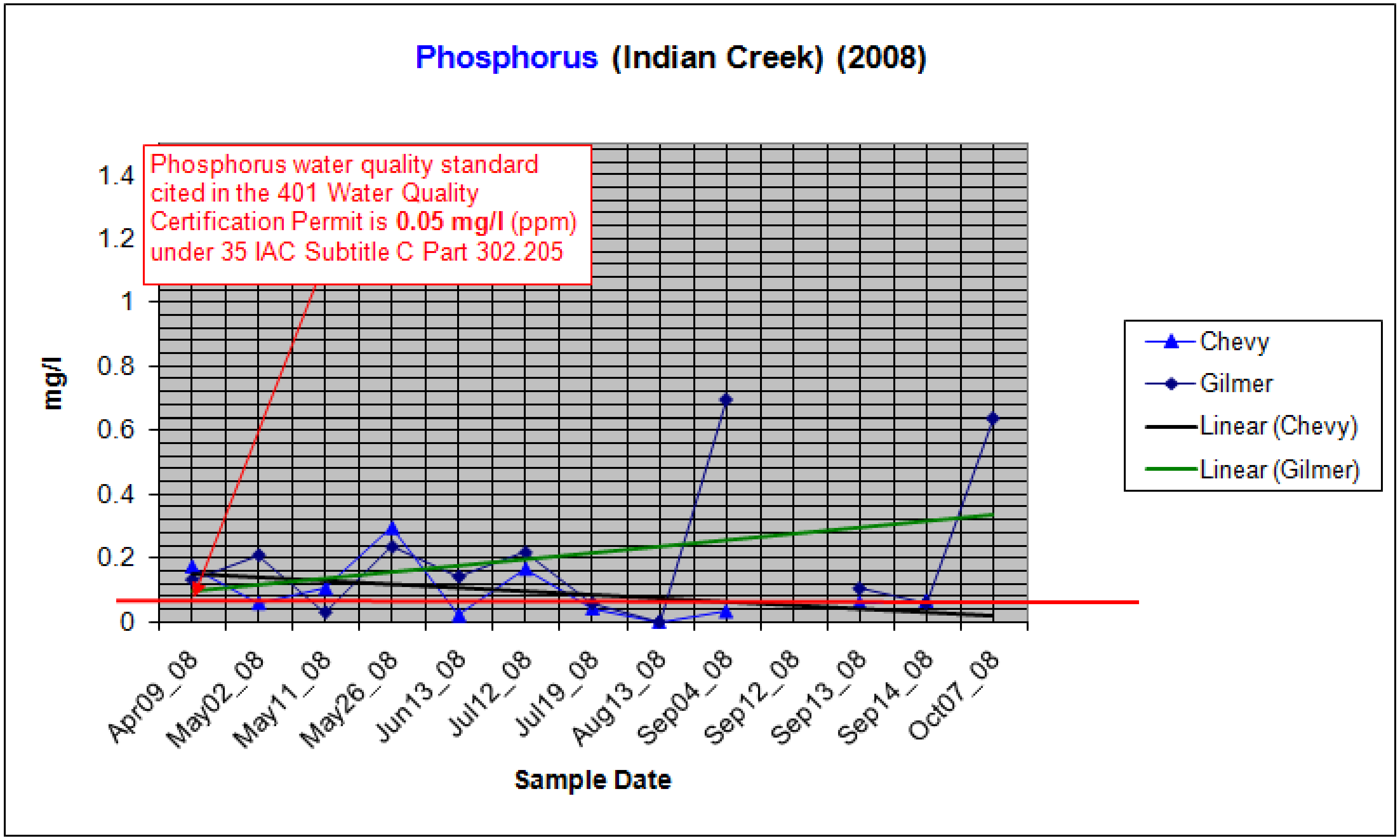



**Figure 10. Phosphorus 2008**

Countryside Lake Association
Mundelien, IL

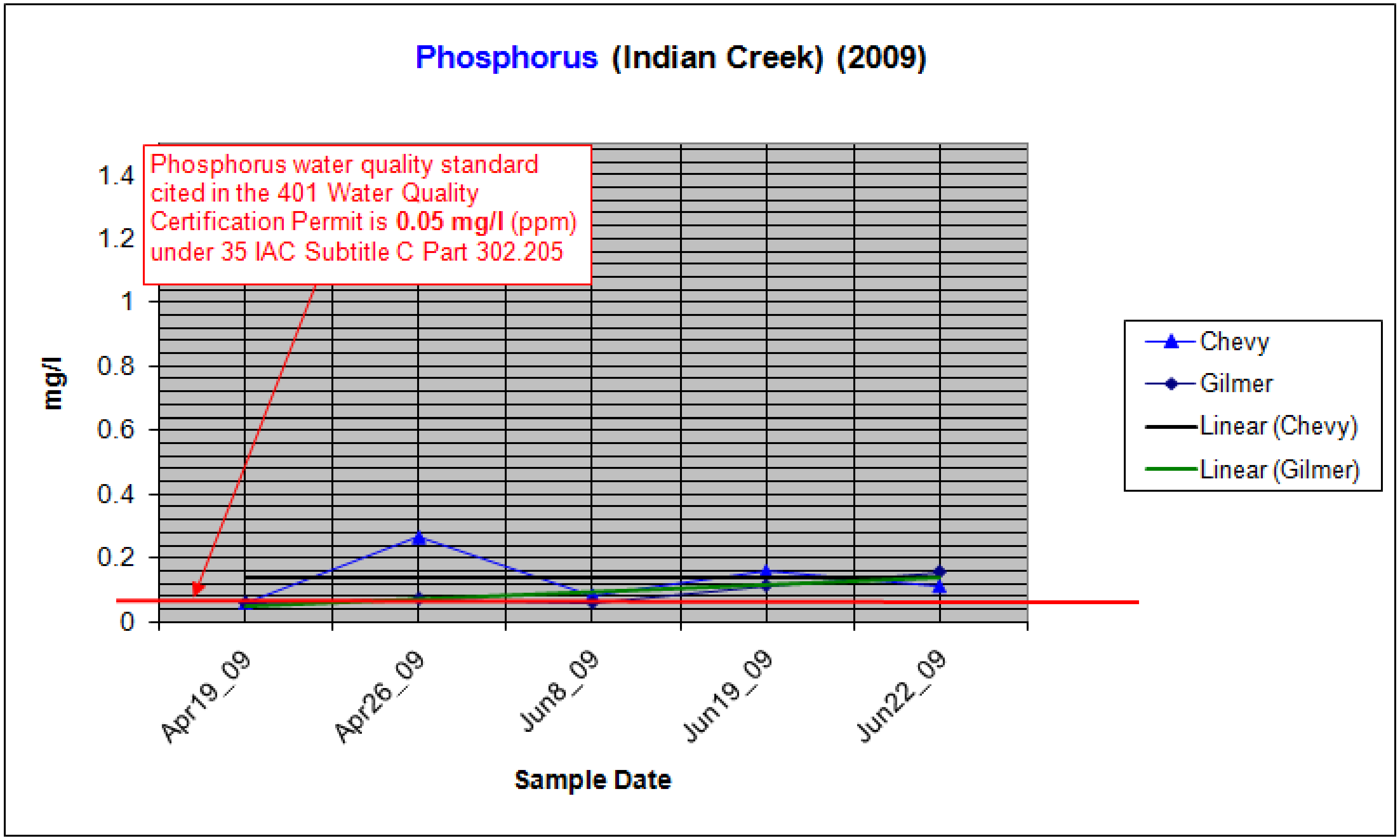



**Figure 11. Phosphorus 2009**

Countryside Lake Association
Mundelien, IL

Phosphorus over all recorded data is shown below. New to this report is the 7 day moving average (in yellow). Note the peak during construction and it being low both before and after.

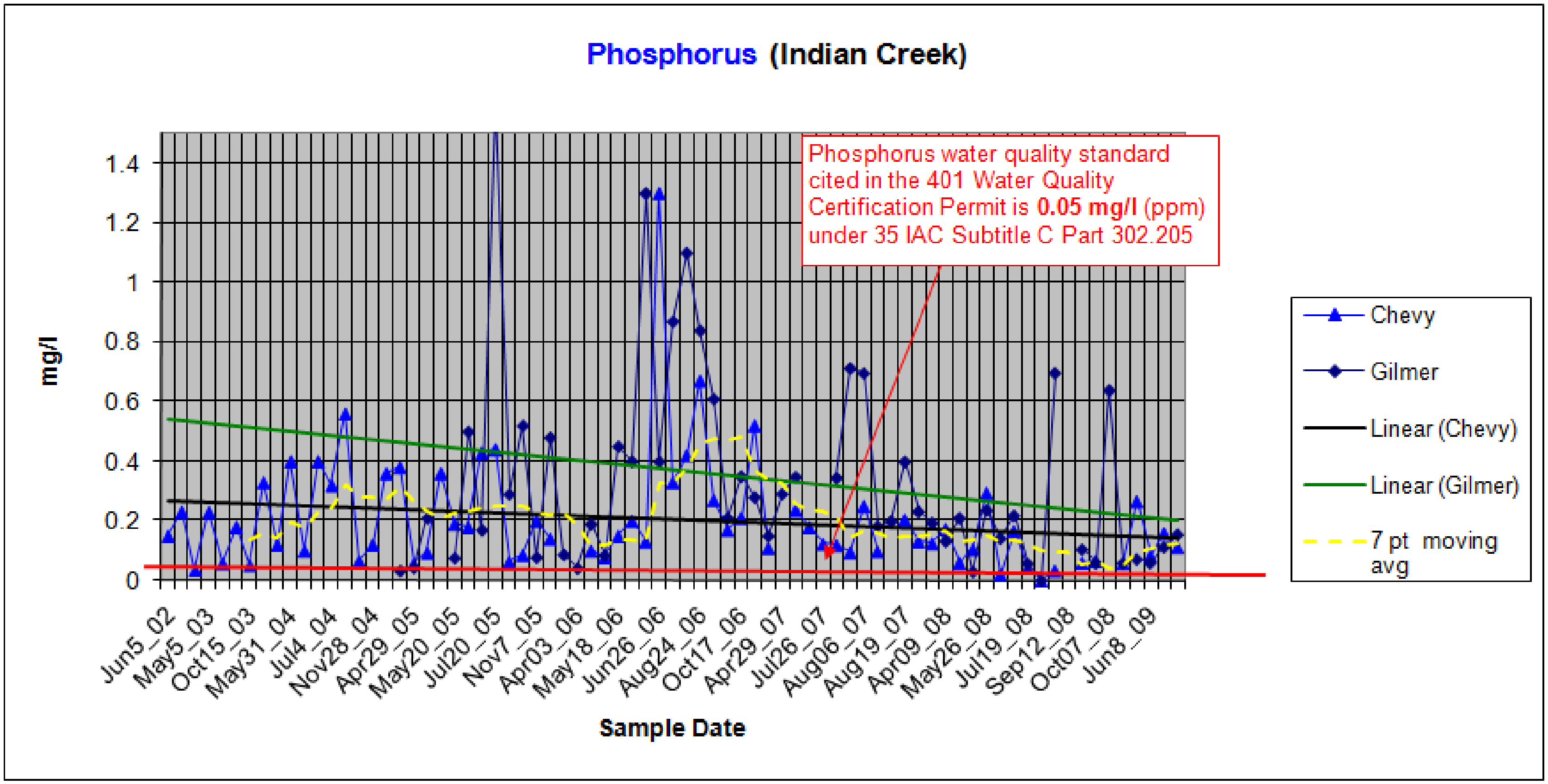



**Figure 12. Phosphorus over all recorded data**

Countryside Lake Association
Mundelien, IL

# Total Organic Carbon

A summary of every year overlaid on top of each other is below. The August 22 2002 event is considered an anomaly, due to either bad sample, data corruption or corrupted sample.

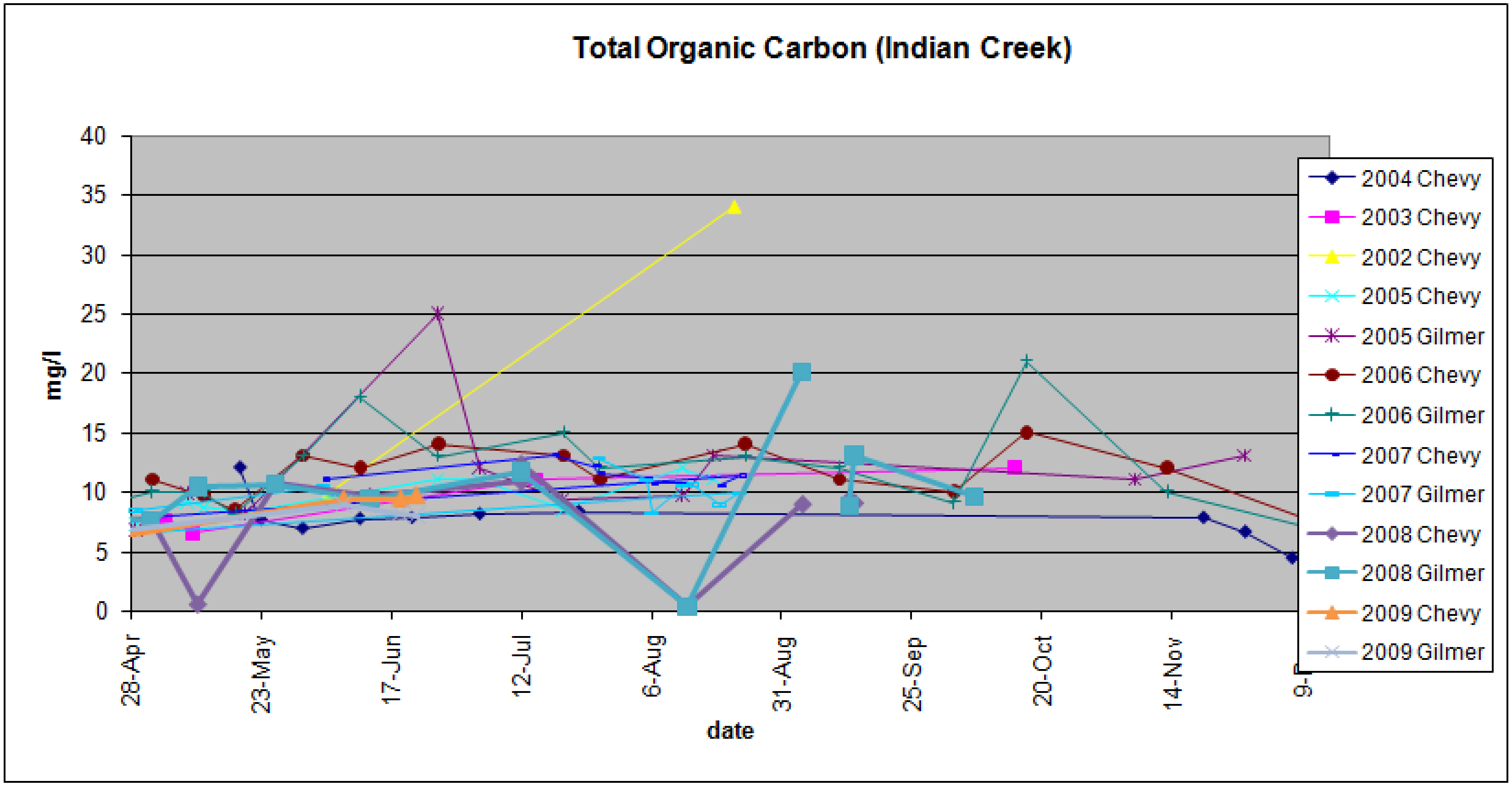



**Figure 13. Year by year comparison of Total Organic Carbon**

Below are shown all data points distinctly *before* the construction began. Most points were generally low. The August 22 2002 event is considered an anomaly, due to either bad sample, data corruption or corrupted sample.

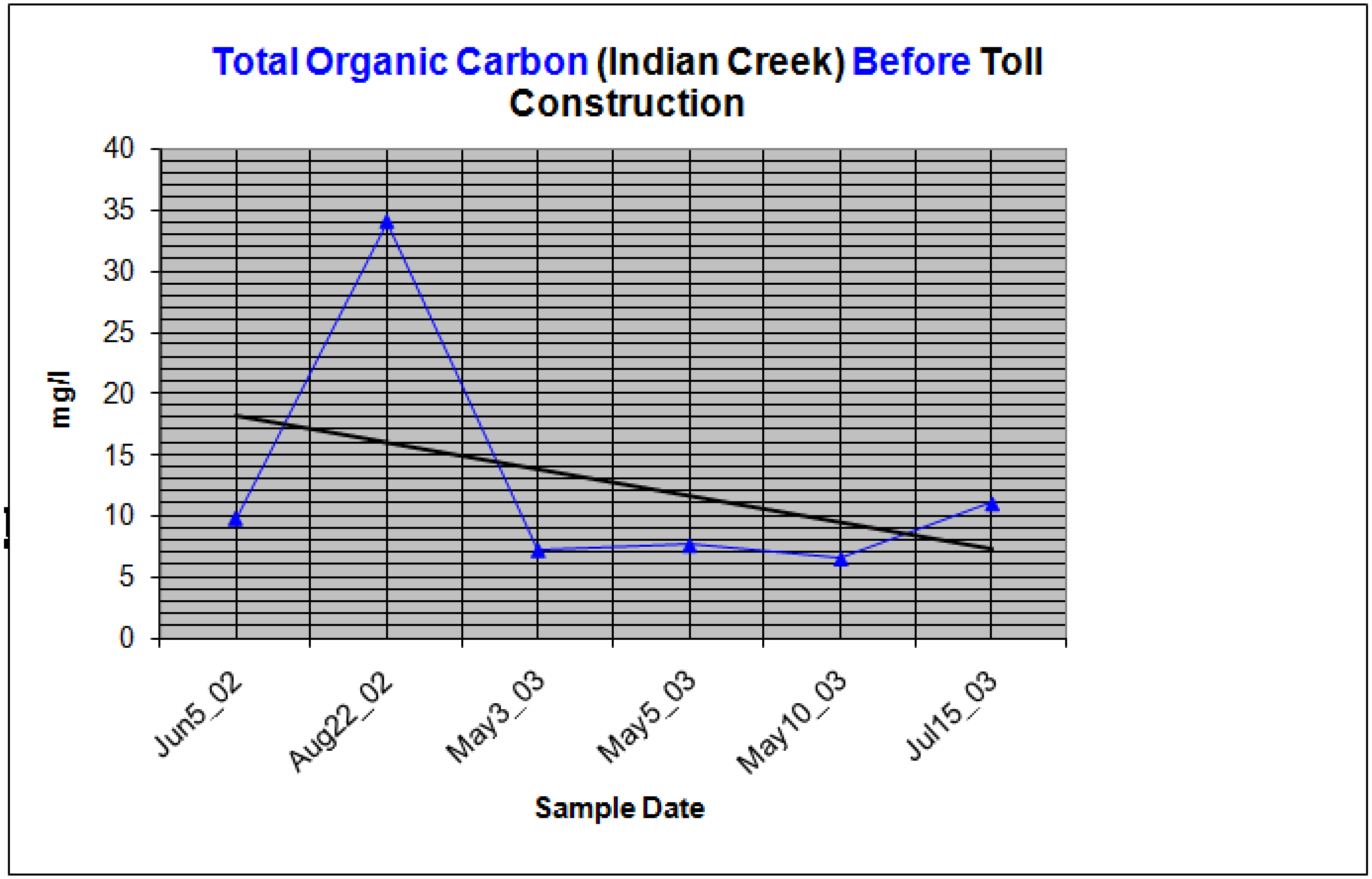



**Figure 14. Total Organic Carbon *Before* Construction**

Countryside Lake Association
Mundelien, IL

Below are shown all data points distinctly *after* the construction began.

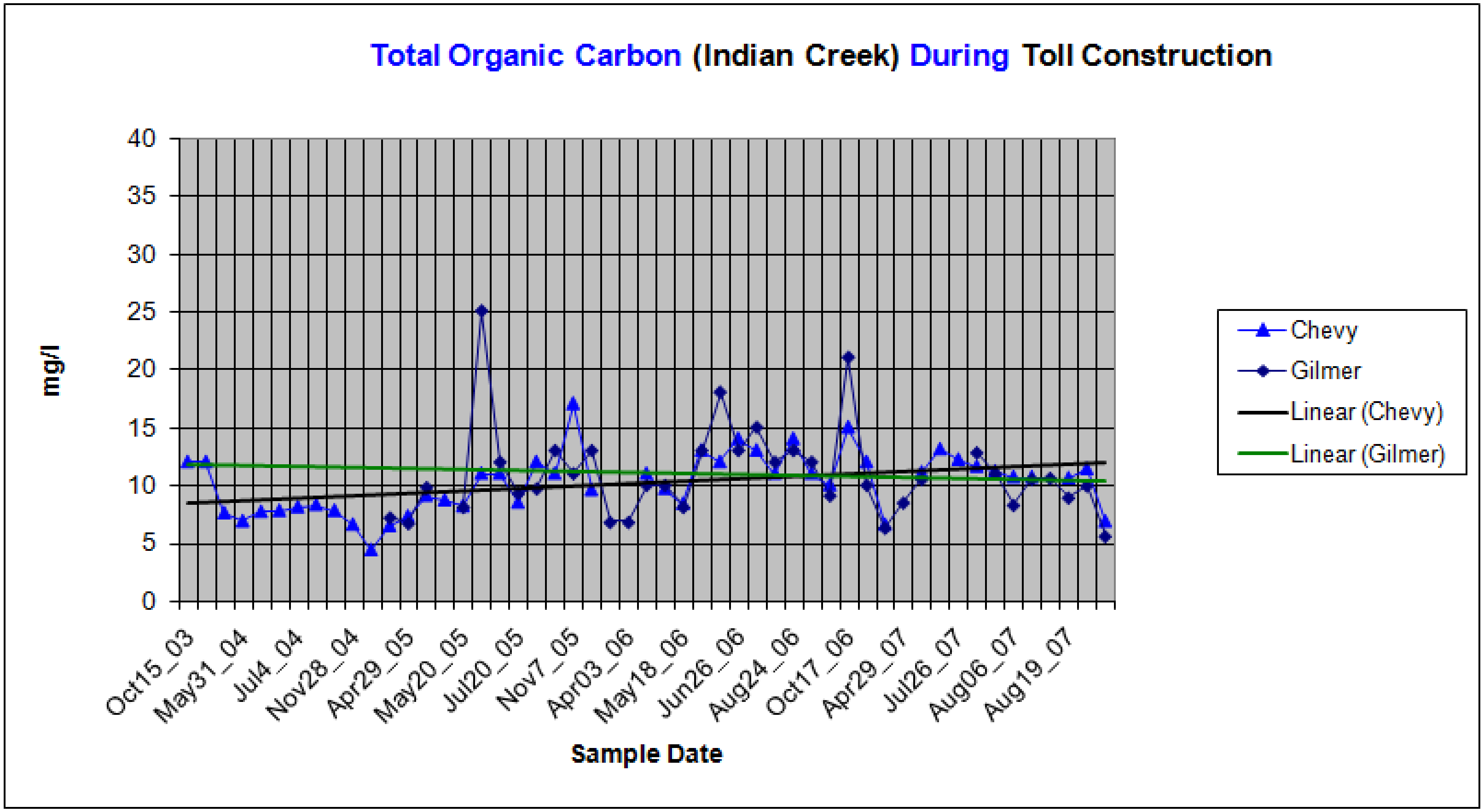



**Figure 15. Phosphorus *During* Construction (2004-2007)**

Countryside Lake Association
Mundelien, IL

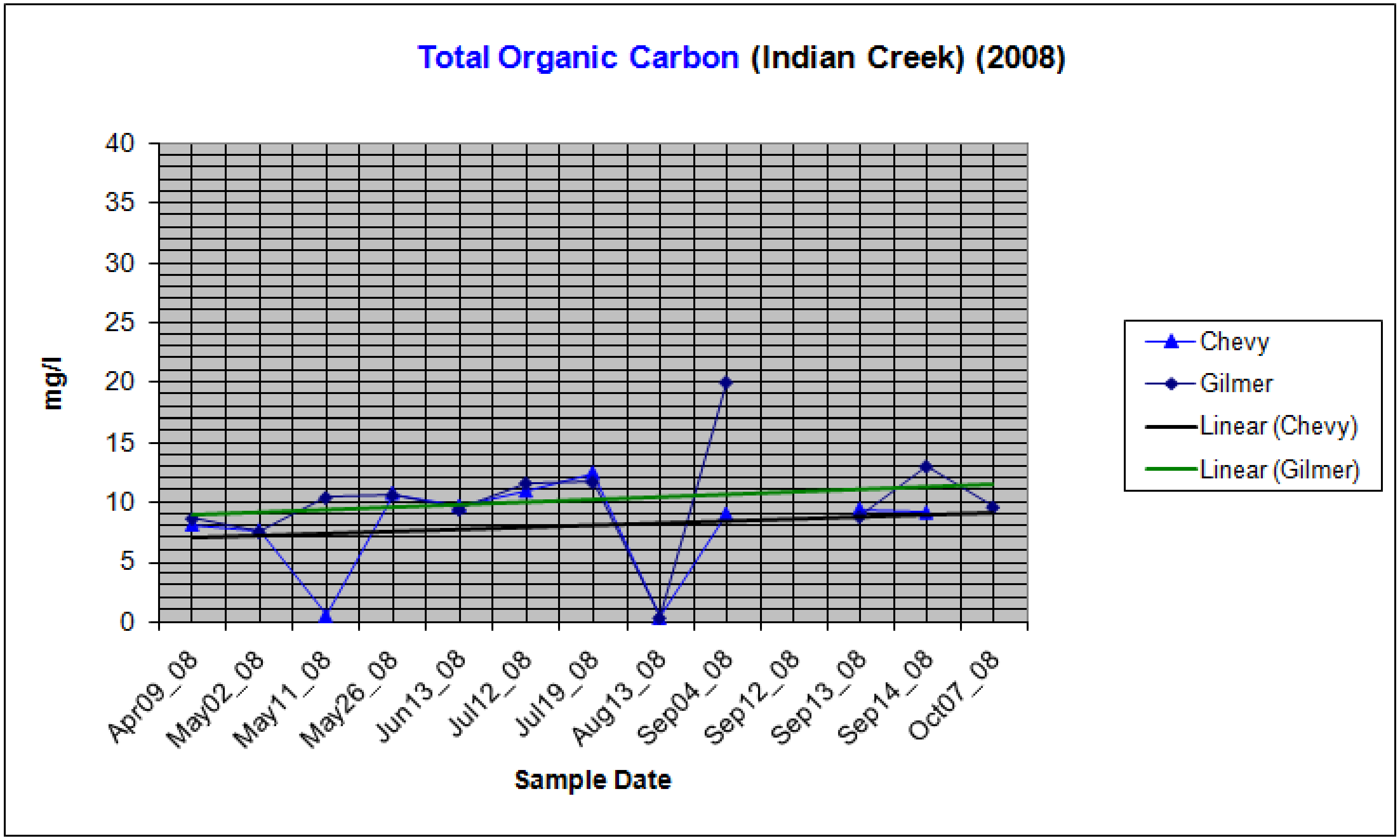



**Figure 16. Total Organic Carbon 2008**

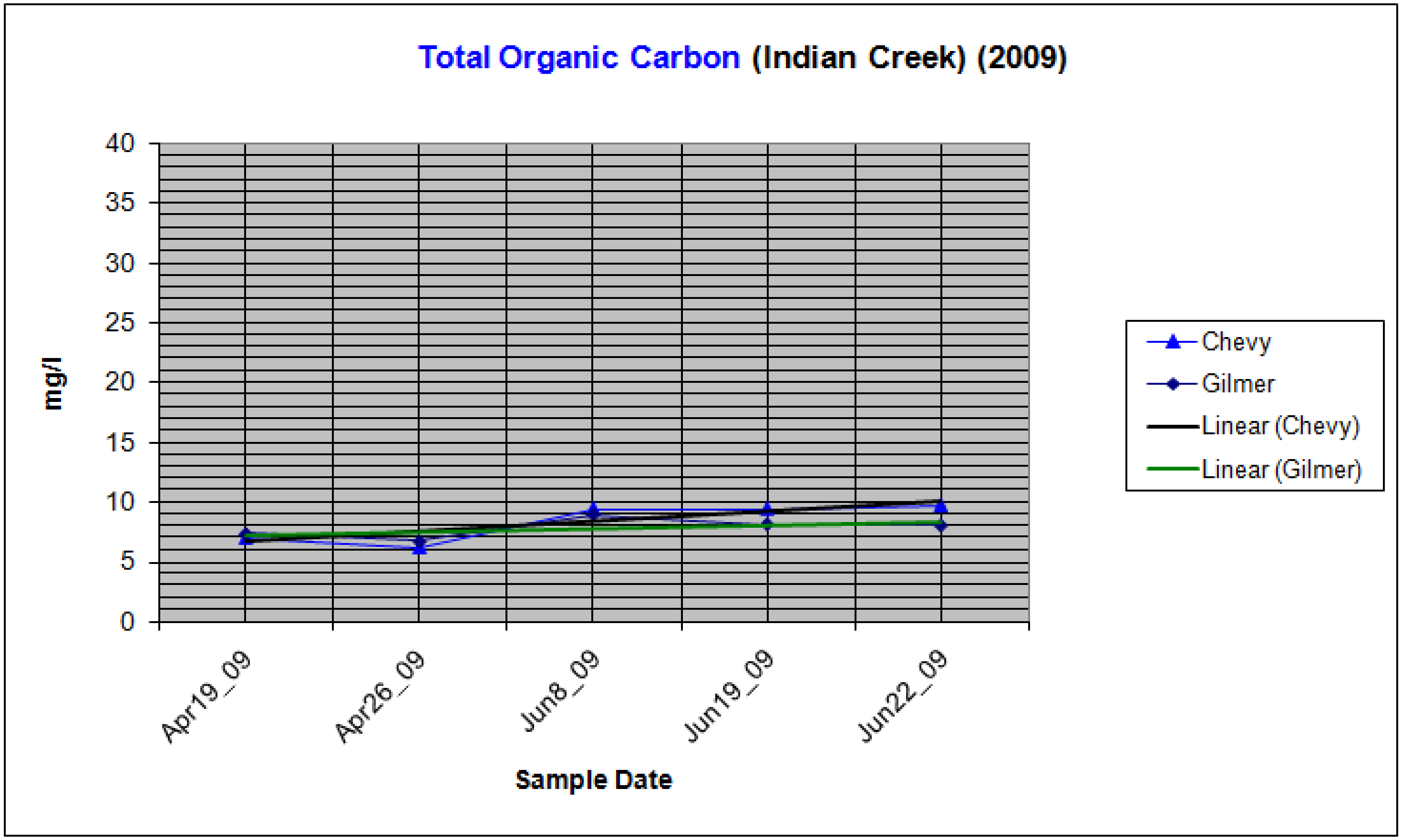



**Figure 17. Total Organic Carbon 2009**

Countryside Lake Association
Mundelien, IL

Total Organic Carbon over all recorded data is shown below. New to this report is the 7 pt. moving average (in yellow). Note the peak during construction and it being low both before and after.

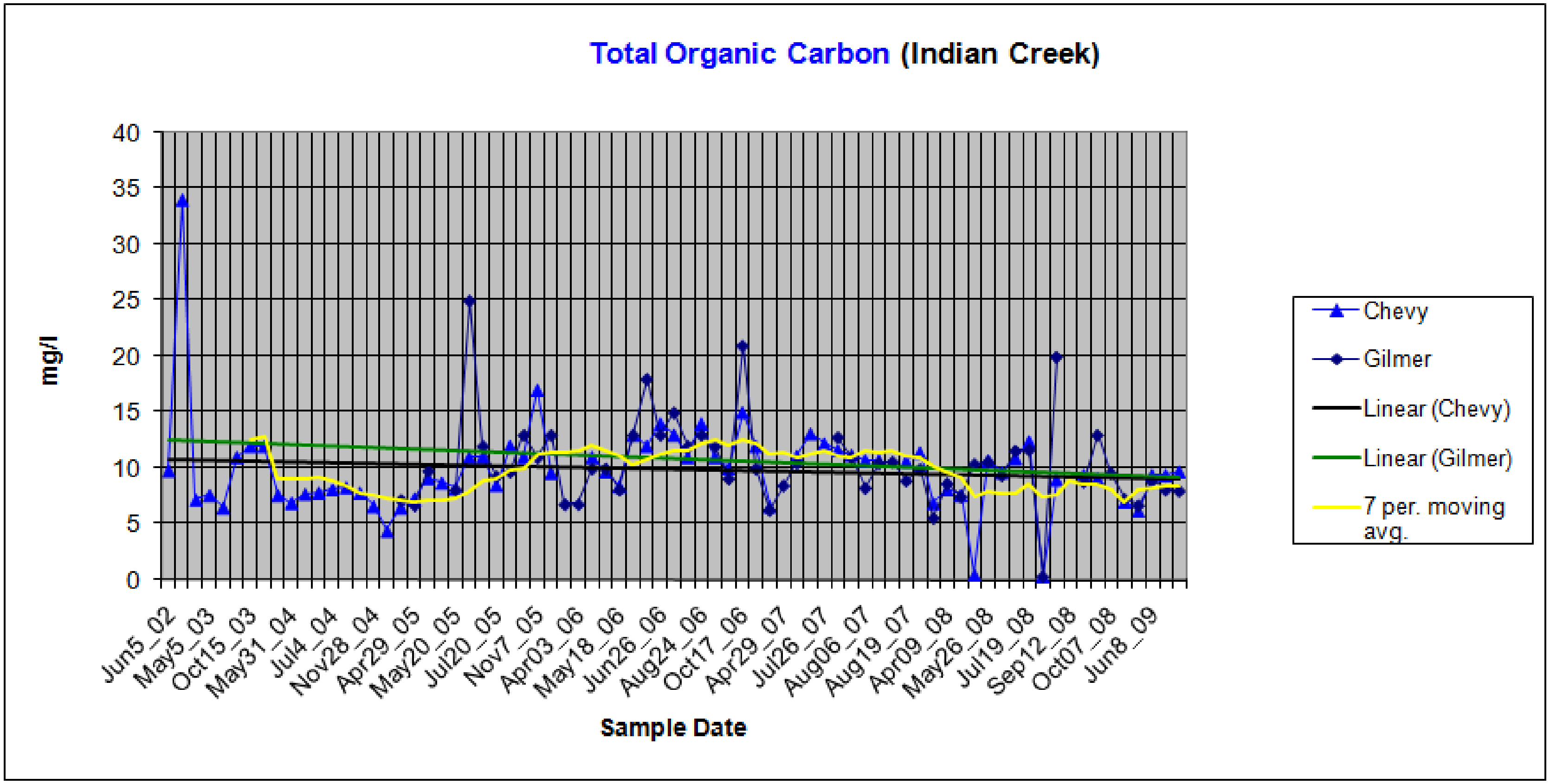



**Figure 18. Total Organic Carbon over all recorded data**

# Appendix C

Quality Assurance Project Plan

# A1 Quality Assurance Project Plan

# Water Quality Studies at Countryside Lake


**Primary Contact_**
Sidney Czynski
Countryside Lake Association, Director
Chair, Water Monitoring Committee
smczynski@sbcglobal.net
(847) 837-0837
(708) 220-3777


## QAPP Approval Signatures

| | |
|---|---|
| **CLA Project Manager & Principal Investigator:** | ______________________ Sidney Czynski |
| **Co-Principal Investigators:** | ______________________ Jim Donndelinger, Water Monitoring Comm. Member |
| | ______________________ Brian Donahoe, Water Monitoring Comm. Member |
| **IEPA Project Manager:** | ______________________ Scott Tomkins, IEPA |
| **IEPA Surface Water Section Manager:** | ______________________ Gregg Good, IEPA |
| **IEPA Quality Assurance Officer:** | ______________________ Michael S. Henebry, IEPA |

**A2 Table of Contents**

## A3 Distribution List

Copies and revisions of this QAPP are provided to all persons named in Section 1, the approvals page, and in A4, Project Task/Organization.

Sean Wiedel, AICP, CFM
Watershed Planner
Lake County Stormwater Management Commission
333 Peterson Road
Libertyville, IL 60048
(847) 918-7693 (phone)
(847) 918-9826 (FAX)
www.co.lake.il.us/smc

Mike Adam, M.S.
Senior Biologist
Lake County Health Department
3010 Grand Avenue
Waukegan, IL 60085
(847)377-8002
www.co.lake.il.us/health/ehs/lakes.asp

Countryside Lake Association
c/o Dan Liberacki
27045 N. Maple Rd.
Mundelein, IL 60060
(847)966-6961
dliberacki@plginc.net

ICWP
c/o Tori Trauscht
76 W. Circle Dr.
Mundelein, IL 60060
ttrausc196@earthlink.net

Chris Kallis
Illinois EPA – DWPC Region 2
9511 West Harrison
Des Plaines, IL 60016
Chris.Kallis@illinois.gov

## A4 Project/Task Organization

Principal Investigator
& Project Manager: Sidney Czynski, CLA Board Director (847) 837-0837, smczynski@sbcglobal.net

Co-Principal Investigators: Jim Donndelinger (847) 949-1872, yakhead@earthlink.net
Brian Donahoe (847) 566-4265, brian@digidescorp.com

**Responsibilities**
Sidney Czynski, Jim Donndelinger & Brian Donahoe work collectively to gather water samples. Brian Donahoe maintains data related to the project and monitors and maintains the main weather station located on his private property. Jim Donndelinger assists with technical aspects of the project as well as monitors and maintains a back-up rain-gauge alarm located on his private property. All three individuals are responsible for quality control and quality assurance.

**A5 Problem Definition and Background**
Countryside Lake and its association members are generally located in Sections 28, 29, 34 and 35 in Fremont Township 44N, Range 10E. Countryside Lake, historically, has served as the headwaters of Indian Creek in Lake County, Illinois. Water enters the lake through the Manning Slough, is filtered through the 147 acres of Countryside Lake and then flows over the Countryside Lake dam spillway to Indian Creek (waterbody ID # GU02) to the DesPlaines River and then on to the Mississippi River and the Gulf of Mexico. Homeowners around the lake have noticed a dramatic change in water clarity and sedimentation in the last few years as developments and impervious surfaces have increased around them. Since 2001 they have been monitoring these changes and sharing them with local authorities such as Lake County Stormwater Management Commission (SMC), Lake County Health Department, Lakes Management Unit, (LCHD-LMU) the Indian Creek Watershed Project (ICWP), and the Army Corps of Engineers. The information has been collected by a team of citizen scientist volunteers who are members of the Lakes Improvement and Management Committee (LIM) of Countryside Lake Association.

Countryside Lake Association (CLA) occupies approximately 800 acres in the Indian Creek Watershed. The total watershed measures approximately 24,108 acres. The lake is a man-made lake created for recreational use by a Chicago Industrialist in 1928. The greatest influence on the lake, according to recent water quality testing is phosphorus. The suspected culprit from the surrounding area is construction of new developments and limited protection of nearby water resources within these new developments. Indian Creek is tributary to many of these new developments and also the largest (highest volume) recharge inlet to the lake.

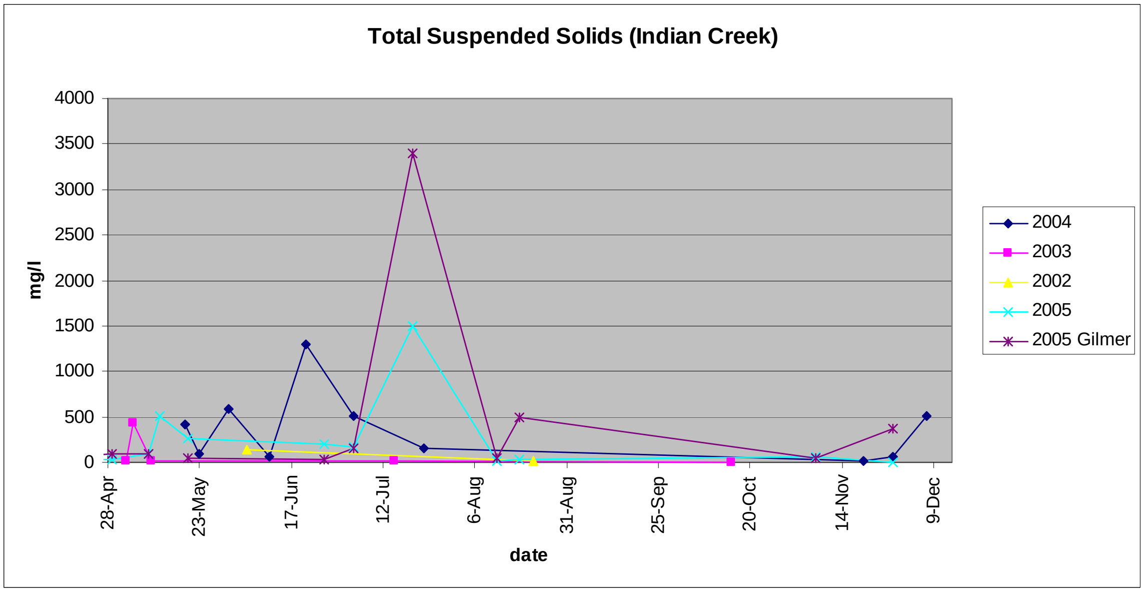
Water has been monitored and tested for the last 5 years by association volunteers. Initially samples were collected by hand in 2002. For the last 3 years they have been collected using the following tools: Davis Weather Monitor II, Solinst leveloggers and barologgers, ISCO sampling units located at 5 lake inlets and at the outflow into Indian Creek. The samplers are triggered to collect samples during rain events to generate representative storm water quality data on selected parameters including sediment (TSS) and total phosphorous (TP) entering the lake from inlet sources. These parameters were advised by LCHD-LMU which has identified phosphorous as the limiting nutrient in the lake and also recognized that erosion sediments in storm water may contribute to phosphorous levels. Bathymetric surveys, navigation draft and observed sediments near some lake inlets have also indicated sediment transport to the lake. Samples are sent to a professional lab, U.S. BioSystems for analysis. The results are reviewed, charted and documented by CLA.

This grant money will be used to purchase updated equipment for the monitoring. The goal of the program is to document water quality entering and leaving the lake during rain events to improve and maintain the water quality as part of a comprehensive stewardship program. Currently, there are no other tests of this sort being conducted in the vicinity or on the ICWP.

**A6 Project Task/Description**
CLA has been monitoring water quality since the fall of 2001 in response to its stewardship interests and for purposes of charting the influence of surrounding developments on the Lake and subsequent flow into Indian Creek. The protocol for monitoring is as follows:

- A weather station was installed on the north central side of the lake to collect wind speed and direction, temperature, barometric pressure, humidity and rain data. The station sends an alarm to a member of the LIM committee during rain events in excess of 3/8" rainfall intensity in 1 hour, or ¾" rainfall in 24 hours. The weather information is published online at: www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KILMUNDE4 the website archives temperature, barometric pressure, wind speed, wind direction, rainfall rate, daily statistics and monthly statistics.
- Due to ongoing reliability issues with pagers in 2006, the committee is currently hand-triggering units. Samplers are located on major inlets or tributaries to the lake. During rain events (night or day) members of the collection team are on call to manage these sites.
- A sixth sampling site is located on Indian Creek upstream of the lake. This unit is triggered earlier and separately by another member of the LIM team after 0.2 inch rainfall and the prospect of a significant storm event.
- 13-24 hours after the pagers are triggered, the water samples are collected by LIM members. The sample collection consists of 4 composite samples from the small lake inlets, and 28 sequential samples are collected at half hour intervals from two Indian Creek samplers. Turbidity testing is completed on each sequential sample and a composite sample is prepared for chemical testing according to the measured turbidity results and storm history.

- Samples are then picked up by a professional lab for analysis.
- Results of the testing are reviewed and documented. Below is an example of a chart.




- This information is then shared with local authorities and interested parties.
- Periodically, a consultant reviews and advises the team on conformance.

Volunteers who work on the committee include a manufacturing engineer, an electrical engineer, and 3 skilled technicians. Over 500 volunteer hours are spent each year on this monitoring. The LIM has invested significant time and money already in this project. In 2006 the committee spent $3,165 on used sampling equipment. With the guidance of an engineering firm, the committee was trained on appropriate methods for achieving the best sampling results. The expenditure on the consultants, laboratory and training was $14,534.00. The CLA has budgeted $18,000 dollars for the upcoming year for water sampling and testing.

Objectives of this project are to chart lake and stream impacts as development and changes in the watershed continue, for the purpose of guiding future lake and stream management practices. All information will be shared with local authorities. The project is consistent with the goals and objectives of the Illinois NPS Management program, specifically; to reduce non-point and point source pollutant loadings from runoff by some measurable standard, communicate that upstream land use decisions affect downstream communities, to educate decision makers at villages, municipalities, corporations and other governmental or non-governmental units. In addition, information on rainfall and patterns will be available that would otherwise not be available for local uses.

| | |
|---|---|
| July 2007 | Award announcement, order monitoring equipment |
| August 2007 | Inspect and calibrate test monitoring equipment, organize and train team to use equipment, run test sampling, outline protocol |
| September 2007 | Begin formal monitoring, run first tests, chart results |
| October-March 2008 | Calibrate and adjust equipment, if necessary, continue to monitor results, review protocol |
| March 2008 | check equipment before rainy season, adjust, if necessary, monitor results, analyze collected data and compare to earlier studies |
| May 2008 | Summarize 1st 6 months of monitoring, maintain equipment, monitor results |
| June-August 2008 | Continue monitoring and charting results |
| September 2008 | First year summation of progress, share results with local authorities |
| October 2008-2009 | Continue project, adjust protocol, if needed, prepare final reports, share with local authorities, amend local management practices, publish information |

## A7 Quality Objectives and Criteria

This study was developed from guidance with STS Consultants Ltd. In the fall of 2000, a plan was developed for monitoring the water quality at CLA. Used monitoring equipment was purchased from the Milwaukee Metropolitan Sanitary District and testing was begun under the guidance of Lake County Health Department, Stormwater Management Commission and STS.

Measurement Objectives and Criteria

| | | | | MS/MSD * | | LCS * | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Minimum Measurement Criteria** | **Minimum Reporting Limit** | **Method and MDL** | **Accuracy (% recovery)** | **Precision (RPD)** | **Accuracy (% recovery)** | **Completeness** |
| Total suspended solids | NA | 4.0 mg/l | EPA 160.2; 2.1 mg/l | N/A | 20% | N/A | 90% |
| Total organic carbon | NA | 1.0 mg/l | EPA 415.1; 0.75 mg/l | 75-115% | 20% | 75-115% | 90% |
| Total phosphorus | 0.05 mg/L ** | 0.01 mg/l | EPA 365.1; 0.12 mg/l | 90-110% | 20% | 90-110% | 90% |

NA = Not Applicable
EPA - EPA Methods for Chemical Analysis of Water and Wastes, March 1983
* = Limits are subject to change based upon capabilities of contract labs
** = Water quality standard for lakes

## A8 Special Training/Certification

No special training or certification will be necessary for this project. Training of new and backup CLA volunteers is planned.

**A9 Documentation and Records**

Project personnel will be periodically updated on progress of data collection throughout the sampling period, including any problems encountered that interfere with maintaining continuous data collection as planned. The principal investigator will be responsible for delivering updated procedures, including the most recently approved QA Project Plan. Other records amassed during the study would include calibration and downloading records for the instruments, field notebooks, and test results and quality control data sheets.

All documents will be maintained and stored by CLA. Electronic records will be maintained and archived on hard drives and network systems. A website will be developed describing the project and results.

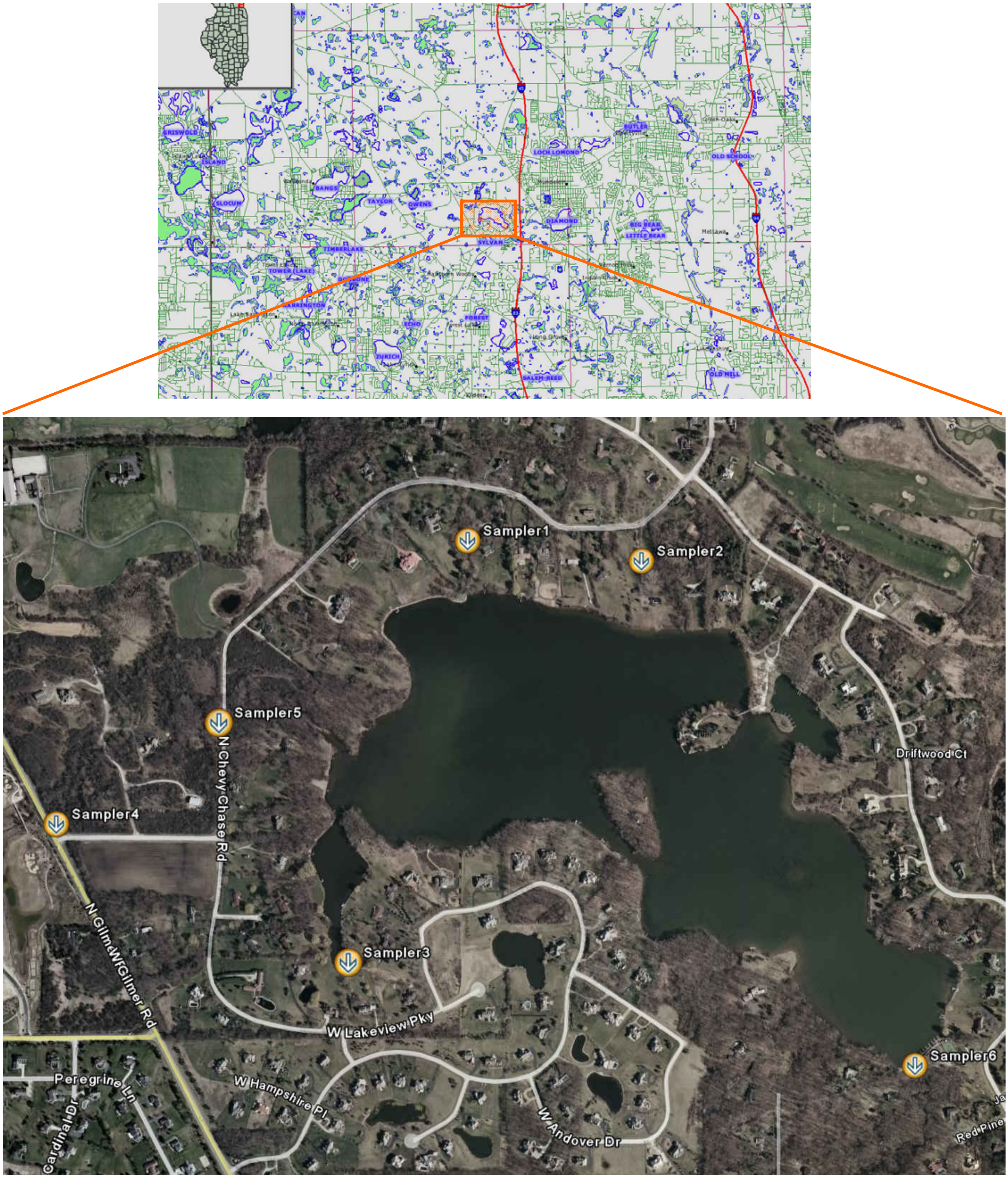
**B1 Sampling Process and Design (Experimental Design)**

The Davis Weather Monitor II is installed and operated at a private residence of Countryside Lake by one of its members. It is approximately 300 feet from the shoreline and 30 feet above the lake surface. The weather sampling instrument provides automatic readings of air temperature, dew point, relative humidity, barometric pressure, wind speed and direction every 5 minutes as well as daily and monthly statistics. Weather information is published online at www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KILMUNDE4 and is checked daily by volunteers and residents. Indian Creek flow data is also gathered using barologgers and leveloggers at key hydraulic structures. The weather data is downloaded, analyzed and charted daily to assess instrument function. The flow data is recorded on a datalogger and downloaded periodically.

Sequential and composite water sampling units are installed on platforms at 5 inlets that flow into Countryside Lake and one at the outflow. Composite water samples are collected during rainfall events of 3/8” rainfall in one hour, or ¾” rainfall in 24 hours. Sequential water samplers are triggered when significant rainfall is anticipated or 0.2 inch rainfall has been recorded at the CLA rain gage. After sequential sample collection, turbidity readings are taken from the sequential samples and the composite samples are sent to a private lab for analysis.

These are the sampler locations around Countryside Lake:

| Sampler | Name | Latitude | Longitude |
|---|---|---|---|
| 1 | Donahoe | 42.257268° | -88.049061° |
| 2 | Larsen | 42.256915° | -88.044737° |
| 3 | Liberacki | 42.249496° | -88.052065° |
| 4 | Indian Creek | 42.252057° | -88.059234° |
| 5 | Chevy Chase | 42.253922° | -88.055235° |
| 6 | Dam | 42.247573° | -88.037866° |


GRISWOLD
ISLAND
SLOCUM
BANGS
TAYLOR
OWENS
TIMBERLAKE
TOWER (LAKE)
BARRINGTON
ECHO
ZURICH
FOREST
SALEM-REED
SYLVAN
LOCH LOMOND
DIAMOND
BUTLER
OLD SCHOOL
BIG BEAR
LITTLE BEAR
OLD MILL
Sampler1
Sampler2
Sampler3
Sampler4
Sampler5
Sampler6
N Chevy Chase Rd
N Gilmer Rd
W Lakeview Pky
W Hampshire Pl
W Andover Dr
Peregrine Ln
Cardinal Dr
Driftwood Ct
Red Pine

## B2 Sampling Methods

Water samples are collected by trained volunteers 13 -15 hours after the initiation of the sampling units. Composite samples are mixed and divided for processing for the following parameters: TSS, T. Phosphorus, and TOC. In this project, our main instruments are the Davis Weather Monitor II weather station and ISCO water sampling units. The Davis Weather station is mounted on a 10' tripod mast with guy wires and a grounding system. It is programmed on site and is UPS (uninterruptible power supply) equipped. The technician running the program is properly trained to minimize the potential for incorrect programming. A Dell computer is used to download data from instruments using cables specific to each instrument. Each instrument has software that handles data downloads (Weather Link 32) and data can be easily transferred into a third party compatible spreadsheet program (Excel). Data from the Davis Weather Monitor can be downloaded by connecting directly to the weather station at its website.

## B3 Sample Handling and Custody

Samples are collected at remote locations by ISCO units which are not refrigerated. Once samples are picked up and tested for turbidity, they are transferred to lab supplied containers which may have preservatives. Samples are kept cool, either by ice in Styrofoam coolers or refrigerated until pick up by the private lab.

Sample Container Preparation and Preservation

| Parameter | Container | Sample Volume | Preservation | Holding Time |
|---|---|---|---|---|
| Total suspended solids | Polyethylene or Glass* | 16oz HDPE | Refrigerate to 4°C | 7 days |
| Total organic carbon | Polyethylene or Glass* | 8oz HDPE | Add HCl, pH<2, Refrigerate to 4°C | 28 days |
| Total Phosphorus | Polyethylene or Glass* | 8oz HDPE | Add $H_2SO_4$, pH<2, Refrigerate to 4°C | 28 days |

Samples are collected in sequential ISCO samplers that are not refrigerated. Sample collection is usually within 24 hours of sampling initiation.

## B4 Analytical Methods

Turbidity is measured by CLA with a La Motte Turbidimeter and magnetic stirrer after calibration of the unit.

Chain of Custody records are kept on the samples. Samples arrive at the lab the following day. Analytical results are sent back to our technician via software program (Microsoft Excel) in spreadsheet format. Hard copies are mailed directly to the team leader.

**B5 Quality Control**

Project investigators, wearing gloves, attach a screw-on lid to all ISCO sample containers at the water sampling sites. After attaching the lid the ISCO containers are transferred to the location where turbidity testing is performed. The samples are removed from the ISCO containers and transferred to containers provided by U.S. Bio-Systems Lab. The U.S. Bio-Systems containers of CLA water samples are kept cooled in Styrofoam coolers until picked up by a private lab (at this time we are using U.S. Bio-Systems). U.S. Bio-Systems picks up the cooler samples within 24 to 48 hours after the samples are gathered and tested for turbidity. The Project Manager/Principal Investigator and the Co-Principal Investigator oversees collection and integrity of samples, transfer of samples to turbidity testing site, and placement of samples in Styrofoam container. Standard Operating Procedures include maintaining the integrity of the sampling sites by clearing brush and debris. Brief notes are taken and recorded if there has been a noticeable disturbance at the site(s). Investigators work in teams of 2 or 3 to ensure samples are properly transported from the samplers to the turbidity testing site. Analysis data prepared by one co-principal investigator is reviewed by the other co-principal investigator and the project manager before it is officially recorded in the Archive Log.

**B6 Instrument/Equipment Testing, Inspection, and Maintenance**

The water quality monitoring instrument will be inspected during calibration. The weather station will be checked for damage during visits to the field site. Data will be downloaded, and the instrument will be re-programmed for further monitoring. Data will be checked onsite for instrument drift.

**B7 Instrument/Equipment Calibration and Frequency**

The LaMotte Turbidimeter is calibrated before each use or once every two weeks. Appropriate standards (10.0 and 100.0 NTU) are purchased from LaMotte.

Weather station probes will be checked for functionality, fouling, and accuracy when data is downloaded every two weeks. The station(s) are monitored and maintained as needed by removing debris, checking equipment for lose or missing parts, replacing batteries, and overall inspection of the entire unit. Weather sensors generally require only yearly calibration. Data from the weather station(s) automatically uploads to the real-time website at: www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KILMUNDE4

**B8 Inspection/Acceptance of Supplies and Consumables**

Supplies needed include 10.0 and 100.0 NTU Turbidity Standards. Supplies provided by the State will be inspected by the Project Manager prior to use.

**B9 Data Management**

All data collected in this study will be stored and maintained at Countryside Lake Association through trained volunteer Brian Donahoe. Copies will be saved both in the specific instrument software, on a hard copy and on an Excel program.

**C1 Assessments and Response Actions**

The results of this project are used as an early-warning system for predicting violations of the clean water act and contamination by non-point source pollution. The mass transport of pollution on Indian Creek where flow monitoring and ISCO are stationed will be reported for each triggering storm event as described in section A5 above.

**C2 Reports to Management**

A final report will be developed describing all of the findings of the study. The previously developed model is available, which supplies a great deal of information about this study.

**D1 Data Review, Verification, and Validation**

All data downloaded from on-site instruments will be checked for consistency and potential errors in transmission. An internal component of the project will be data verification between the information collected and the previously developed models for assessing damage to water supplies.

**D2 Verification and Validation Methods**

During the data verification and validation stage, the process of data downloading and checking will be reviewed. Transfer of data between databases and transfer to different files will be reviewed. Statistical analyses and model development will include the review of calculations and measurements.

**D3 Reconciliation with User Requirements**

The proposed outcome of this project is a useable system for recognizing problems in the water early and developing strategies for mitigating and preventing those problems, i.e., appropriate BMP. In the process of obtaining this outcome, the data will be intensively analyzed. This information would prove useful for assisting other stakeholders with their own management strategies.

**References**


a. **Illinois Department of Natural Resources, Division of Fisheries, 600 N. Grand Ave. W., Springfield, IL 62701-1787, (217)782-6424, 24 hour fish information, 1-800-ASK-Fish, www.dnr.state.il.us**
b. **Illinois Department of Public Health, Division of Environmental Health, 525 W. Jefferson ST. Springfield, IL 62761, (217)782-5830, www.idph.state.il.us**
c. **Illinois Environmental Protection Agency, Lake Management issues, P.O. Box 19276, Springfield, IL 62794-9276, Regional offices in Des Plaines, 9511 W. Harrison Street, (847) 294-4000 Springfield (217)786-6892, Marion (618)993-7200, Bureau of Water, planning (217)782-3362, permits (217)782-0610, Division of Public Water Supplies, permits (217)782-1724, Source Water Protection program (217)785-4787, www.epa.state.il.us**

d. **Illinois Lakes Management Association, ILMA, P.O Box 20655, Springfield, IL 62708, (217)544-4562, www.ilma-lakes.org**
e. **Indian Creek Watershed, cleanwater@indiancreekwp.org**
f. **Lake County Stormwater Management, Watershed Development Ordinance, 777 Peterson Rd., Libertyville, IL 60048, (847)918-7863, www.co.lake.il.us/smc**
g. **Lakes Management Unit Lake County Health Department, 3010 Grand Ave., Waukegan, IL 60085 (847)360-6747. www.co.lake.il.us/health/ehs/lakes.asp**

# Appendix D

Labor and Cost Summaries

CLA 319 GRANT LABOR and EXPENSES SUMMARY

| Project Cost Summary | | Estimated Totals | Actual Totals |
|---|---|---|---|
| 1. | Direct Labor | $15,250.00 | $ 17,783.11 |
| | Project Manager | 6,000.00 | $ 6,600.00 |
| | Project Volunteers | $ 8,000.00 | $ 8,783.11 |
| | Technical Assistance | 1,250.00 | $ 2,400.00 |
| 2. | Indirect Costs | $0.00 | |
| 3. | Equipment, Materials, Supplies | $ 8,500.00 | $ 13,298.11 |
| | Weather Station Software | 200.00 | $ - |
| | Turbidity Meter | $ 1,300.00 | $ - |
| | Automated Sampler Units | 7,000.00 | $ 7,730.68 |
| | Flowmeter | | $ 5,567.43 |
| 4. | Travel | $ - | |
| 5. | Subcontracts | $ 12,000.00 | $ 12,386.00 |
| | Subcontractor Services | 6,000.00 | $ 4,180.00 |
| | Laboratory Analyses/Sampling Training | $ 6,000.00 | $ 8,206.00 |
| **TOTAL** | | $ 35,750.00 | $ 43,467.22 |

**Assistance Amount at** 40.559441%

**Recipient Share at** 59.444056%