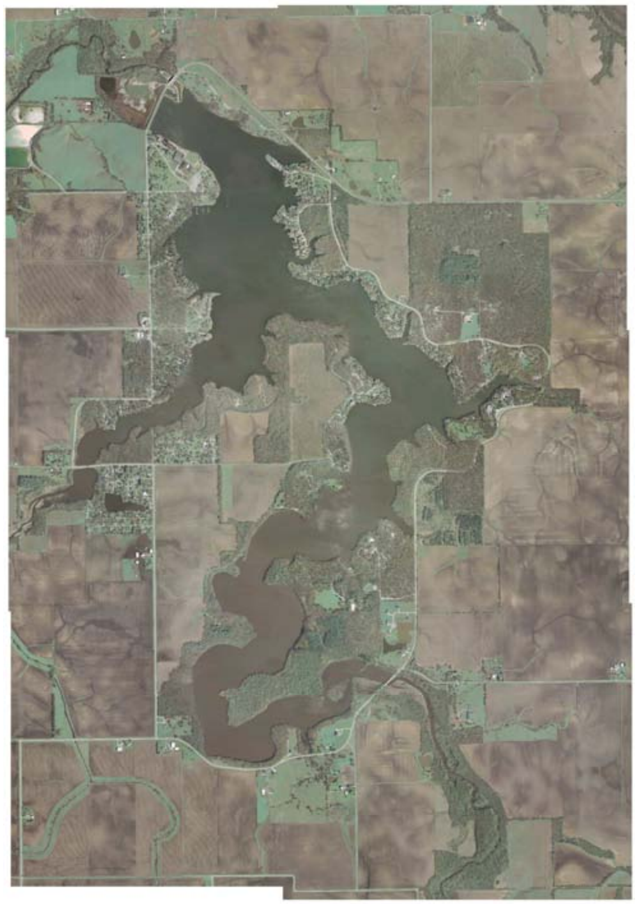
Lake Bloomington Watershed Plan



Prepared by:

Lake Bloomington Watershed Planning Committee

McLean County Soil and Water Conservation District

Illinois Environmental Protection Agency

NRCS Natural Resources Conservation Service

Association of Illinois Soil & Water Conservation Districts

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Mission Statement

We the people of the watershed of Lake Bloomington will address water quality impairments using proactive strategies that maximize local control in order to improve and protect water quality and the sustainable use of our watershed resources.

Introduction

Section 303(d) of the Clean Water Act (CWA) and the U.S. Environmental Protection Agency (USEPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify water bodies that do not meet water quality standards and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the impairment. A TMDL is the total amount of pollutant load that a water body can receive and still meet the water quality standards. It is the sum of the individual waste load allocation for point sources, load allocations for nonpoint sources, natural background, and a margin of

safety that addresses the uncertainty in the analysis. The CWA establishes the process for completing TMDLs to provide more stringent, water-quality based controls when technology-based controls are not sufficient to achieve state water quality standards. The overall goals and objectives in developing the TMDLs include:

- Assess the water quality of the impaired waterbodies and identify key issues associated with the impairments and potential pollutant sources.
- Use the best available science and available data to determine the maximum load the waterbodies can receive and fully support all of their designated uses.
- Use the best available science and available data to determine current loads of pollutants to the impaired waterbodies.
- If current loads exceed the maximum allowable load, determine the load reduction that is needed.

• Identify feasible and cost-effective actions that can be taken to reduce loads.

• Inform and involve the public throughout the project to ensure that key concerns are addressed
and the best available information is used.

• Submit a final TMDL report to USEPA for review and approval.

The Illinois Environmental Protection Agency (IEPA) only requires a TMDL be developed for the chemical parameters with numeric water quality standards. Under Section 303(d) of the CWA, the State of Illinois prepares a list of waters that are not meeting state water quality standards (hereafter referred to as the “303(d) list”) in each 2-year cycle. Lake Bloomington (waterbody ID RDO) is listed as impaired because of excessive nitrate and phosphorus in the water (IEPA, 2006).

IEPA implements its TMDL Program in three stages. Stage One was completed in November 2006 and involved the characterization of the watershed, an assessment of the available water quality data, and an identification of potential technical approaches (Tetra Tech, 2006) Stage Two involves additional data collection which was not required for Lake Bloomington. Stage Three involves model development and calibration, TMDL scenarios, and implementation planning. The TMDL Stage Three Report documents the modeling and TMDL components of Stage Three and briefly describes the implementation plan.(Tetra Tech Phase 3, 2007). THE USEPA approved the Lake Bloomington TMDL for Total Phosphorus and Nitrate in September 2007.

In the IEPA report, Chapter 1 discusses the rationale for beneficial use designations and impairments for Lake Bloomington which is located in central Illinois. Chapter 2 describes the characteristics of the watershed and water bodies. Chapter 3 describes the water quality standards and water quality assessment of existing data. Chapter 4 summarizes the nonpoint and point sources in Lake Bloomington. Chapter 5 describes the technical approach used for the TMDL development including modeling approach and calibration. Chapter 6 presents the TMDL components including load allocations. Finally, Chapter 7 briefly describes the implementation plan.

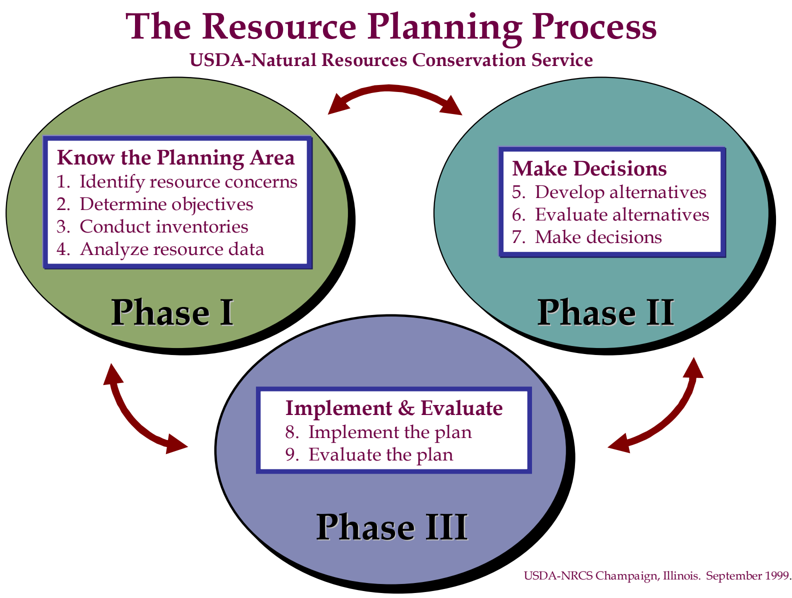
A review of the available water quality data from the TMDL Stage One report confirms the causes of impairments in Lake Bloomington. Of the pollutants impairing Lake Bloomington, total phosphorus and nitrate are the only parameter with numeric water quality standards. The water quality data also
verified that total phosphorus is a limiting nutrient in the lake and frequently exceeded the 0.05 mg/L water quality standard. The nitrate plus nitrite nitrogen

concentration data is used to verify the exceedance because nitrite nitrogen seldom appears in concentration greater than 1 mg/L and tends to transform to nitrate. The maximum observed nitrate plus nitrite concentration exceeded the standard of 10mg/L in Lake Bloomington.

All Illinois waters must meet general use water quality standards unless they are subject to another specific designation (CWA Section 302.201). The general use standards protect the state's water for aquatic life (except as provided in Illinois Water Quality Standard Section 302.213), wildlife, agricultural use, secondary contact use, aesthetics quality, and most industrial uses.

In December 2006, the McLean County Soil and Water Conservation Districts (SWCD) and the McLean County Natural Resource Conservation Service (NRCS) invited landowners, representatives of local governments, local experts, and concerned citizens to meet to address the issue of elevated levels of phosphorus, nitrates and sediment in Lake Bloomington. From that initial group a Planning Committee was formed, which then developed a list of action points that needed to be investigated. The Planning Committee then appointed a Technical Committee to address the individual problem statements, investigate existing data of Best Management Practices to address the problems, inventory resources in the watershed and develop alternatives. The Technical Committee divided into several areas of expertise: the Biological/Streams Committee, the Urban Committee, a Homeowners Committee, a Drinking Water Quality Committee, an Educational Committee, and the Agriculture Committee. Funding for the entire Lake Bloomington Watershed Plan development was through grants by the Illinois Environmental Protection Agency, while implementation funding will be from IEPA, Association of Illinois Soil & Water Conservation Districts (AISWCD), SWCD, Sand County Foundation, and NRCS, as well as other local and private funding.

The committee started the planning process under the guidance of NRCS and used a three phase planning approach.



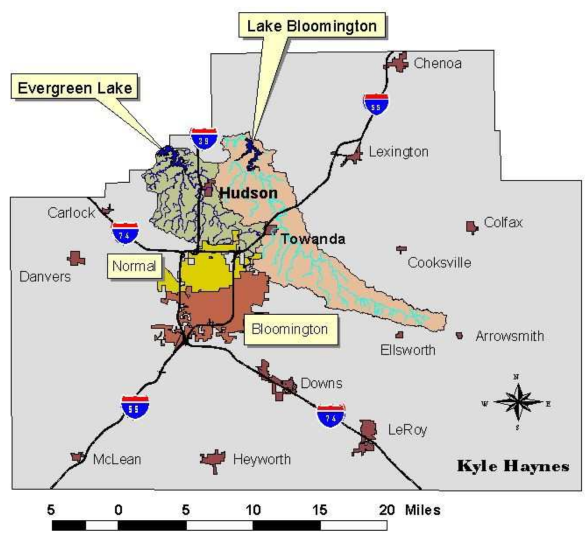
Stakeholders were invited to committee meetings and provided with plan drafts. Their input was integrated into the final plan. Members of the Planning and Technical Committees are in Appendix I.

Watershed Description

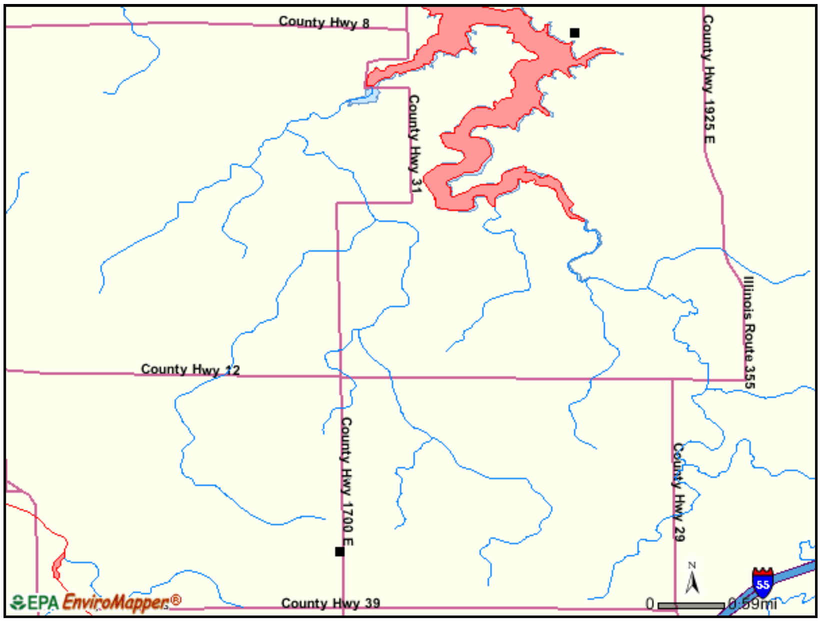
General Overview

Lake Bloomington (572 acres) watershed consists of 43,100 acres in the central part of McLean County, Illinois. It is located in central Illinois about 160 miles northeast of St. Louis and approximately 125 miles southwest of Chicago. It is in the Mackinaw River Basin, (Hydrologic Unit Code) HUC #07130004, sub-basin code 030. The watershed encompasses hydrologic unit 16, Upper Money Creek and the majority (upstream of the dam) of hydrologic unit 09, Lower Money Creek. The communities of Towanda and Merna are located entirely within the watershed. The City of Bloomington and Incorporated Town of Normal are expanding into the southwestern edge of the watershed.

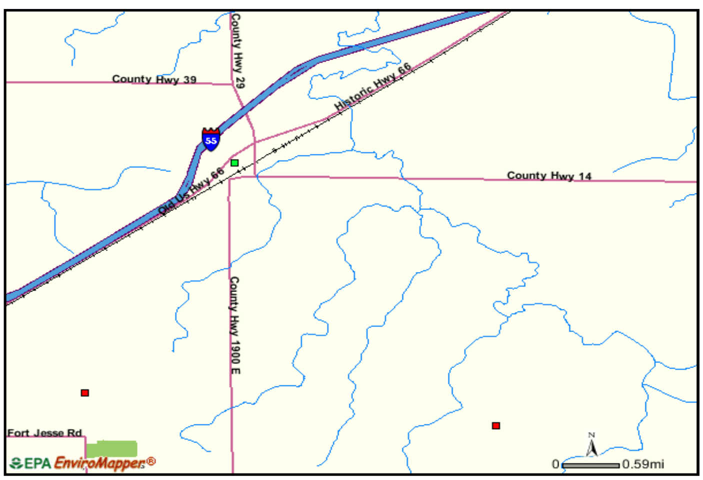
Lake Bloomington is located in the northern part of the watershed. It was constructed in 1929 by the impoundment of Money Creek. Hickory Creek is a tributary of Money Creek which empties into Lake Bloomington. Only two of the tributaries have IEPA identification numbers at this time: RDO (Bloomington) and DKP-20 (Money Creek). The lake was constructed to expand the water supply for the City of Bloomington. To fully utilize the lake's potential, recreation and residential development were established as second and third priority uses respectively. Water use is for domestic, commercial industrial, public and agricultural uses. The Lake Bloomington watershed is immediately adjacent to the Evergreen Lake watershed. Lakes Bloomington and Evergreen were both constructed for a water source for Bloomington, and have similar geology and land use. The similarities between the two lakes allows for studies and inventories on one lake to be applied to both lakes. The watershed plans for both watersheds, as well as any other watersheds contained entirely within McLean County, will be implemented and coordinated by the same oversite committee.



There are five water, multiple, and/or waste point sources in the watershed as identified by the EPA. Myers, Inc (Hazardous waste), East Bay Camp (multi), Ni-Cor Gas (multi), American Disposal Services (water), Vineyards Subdivision (water), and Myers, Inc. (Hazardous waste).



East Bay Camp and NiCor location



Vineyards Subdivision, Myers, Inc., and American Disposal Locations

Watershed History

Geological

The uppermost bedrock within the Lake Bloomington watershed is mostly Pennsylvanian age, 286-320 million years ago. The Pennsylvanian formations are made of cyclic beds of sandstone, shale, siltstone, limestone, coal, and clay. These rocks contain 1-2% coal by volume. Much of the Pennsylvanian bedrock is covered by Quarternary deposits up to 500 feet thick.

McLean County is mostly on a loess-covered till plain. Glacial movements, running water, and windblown deposits have contributed to the formation of the land within the county. McLean County also consists of a series of glacial deposits formed about 15,000 to 20,000 years ago by the Wisconsonian glacial movements. As the ice sheets moved south, they began to melt and recede, leaving moraines and ridges lying northwest to southeast. The Bloomington Moraine is one of the largest, which runs immediately south of the watershed. The land north of the Bloomington Moraine is gently sloping (1-4% slope), except for steeper slopes (4-10%) near the Mackinaw River to the north of the watershed.

Soils data and GIS files from the Natural Resources Conservation Service (NRCS) were used to characterize soils in the Lake Bloomington watershed. General soils data and map unit delineations for the country are provided as part of the Soil Survey Geographic (SSURGO) Database. Field mapping methods using national standards are used to construct the soils maps in the SSURGO database. Mapping scales generally range from 1:12,000 to 1:63,360; SSURGO is the most detailed level of soil mapping done by the NRCS. A map unit is composed of several soil series having similar properties. Identification fields in the GIS coverage can be linked to the database that provides information on chemical and physical soil characteristics. The SSURGO database contains many soil characteristics associated with each map until. Of particular interest are the hydrologic soil group and the K-factor of the Universal Soil Loss Equation (USLE).

The hydrologic soil groups have similar infiltration and runoff characteristics during periods of prolonged wetting. Typically, clay soils that are poorly drained have lower infiltration rates, while well-drained sandy soils have the greatest infiltration rates. USDA has defined four hydrologic groups for soils listed below:

Soil Group A-

Soils with high infiltration rates.

Usually deep, well drained sands or gravels.

Soil Group B-

Soils with moderate infiltration rates.

Usually moderately deep, moderately well drained soils.

Soil Group C-

Soils with slow infiltration rates.

Soils with finer texture and slow water movement.

Soil Group D-

Soils with very slow infiltration rates.

Soils with high clay content and poor drainage.

High amounts of runoff.

Soils may be assigned to dual groups if drainage is feasible and practical. Dual hydrologic groups, A/D, B/D, and C/D, are given for certain wet soils that can be adequately drained. The first letter applies to the drained condition, and the second to the undrained. Only soils that are rated D in their natural condition are assigned to dual classes. For the Lake Bloomington watershed, Hydrologic Soil Group B covers 38.7% and dominates the south-eastern portion of the watershed and is found adjacent to Lake Bloomington and the middle and northern sections of Money Creek. Group B/D accounts for 59.8% and is evenly spaced throughout the watershed and found adjacent to the southern section of Money Creek. Group C covers 0.6% and is found in small areas surrounding Lake Bloomington the the northern section of Money Creek upstream from the lake. Group C/D accounts for 0.9% and is found sparingly throughout the watershed.

The Lake Bloomington watershed is heavily tiled (7,500 acres or 18%) to promote agricultural drainage. The draining tile system increases the possibility for soluble nitrogen to reach surface water. In addition, some private septic systems may be connected with the drain tile system and provide a direct load to the streams, especially under low flow conditions.

BIOLOGICAL FEATURES OF LAKE BLOOMINGTON WATERSHED

The Lake Bloomington watershed lies within the Grand Prairie Natural Division of Illinois. Prior to settlement, watershed plant communities consisted of upland prairie (85%), wet prairie (3%), upland forest (10%) and bottomland forest (2%). Existing areas of these plant communities are currently limited in the watershed, with virtually no remaining upland or wet prairie. Present vegetative cover includes cropland (corn and soybeans), pasture, farmsteads, forest, and typical urban landscaping.

Grasslands and Prairie:

Although tallgrass prairie was the dominant ecosystem in the watershed, no original prairie remains. A few prairie plantings exist as a part of nature preserves and CRP lands, but except in the case of the Moon Tract of ParkLands, such plantings are of low diversity. Some prairie grassland animal species were able to shift to non-native grassy crops and pasture, but much of this habitat has been replaced by intensive row crop agriculture. Where non-native grassy habitat remains, outside of CRP acreage, much is made an ecological trap because of the timing of mowing interferes with migratory bird breeding. Prairie is an ideal vegetation type to control soil erosion, and encouraging of more acreage in such vegetation would confer great benefit to streams and wildlife.

Forest:

The forested area around Lake Bloomington is one of the larger remaining tracts in McLean County. Like many areas, it suffers from habitat fragmentation and both invasive non-native and aggressive native species. No botanical surveys have been done to assess the significance of the remaining fragments. Ecological restoration is critically needed to preserve remnant habitats, and special attention needs to be focused on preserving the oak and hickory species that are under threat from deer browse pressure, invading maple trees, and fire suppression.

Wetlands:

Wetlands were an important feature of the pre-settlement watershed, both in the floodplain of the streams and in the uplands. Wet prairies and riparian woodlands were important habitat for diverse species. There are approximately 1,100 acres of wetlands in the Lake Bloomington watershed. The National Wetland Inventory indicates that approximately 75 acres of wetlands are located around the lake where the tributaries approach the normal pool elevation of the lake. These are mostly palustrine areas with emergent and woody vegetation that are temporarily or seasonally flooded during the growing season.

Interestingly, the mud flats that form during dry years at the southern end of the Lake regularly attract migrating shorebirds. These are the most significant mud flats in the county, and attract enthusiastic birdwatchers from around Central Illinois.

Biota (Plants and Wildlife):

1. General

Our knowledge of the wildlife of the watershed consists of anecdotal information and, in the case of native fish and mussels, focused surveys. It is clear that much more work is needed to determine the species of plants, invertebrates (other than mussels), and vertebrates (other than fishes) that inhabit the watershed. A special focus is needed to determine the presence of organisms that are Species in Greatest Need of Conservation (Illinois Wildlife Action Plan: dnr.state.il.us/ORC/WildlifeResources/theplan/species.htm) or officially listed as state or federal Threatened and Endangered Species (dnr.state.il.us/espb/datelist.htm). Despite the lack of comprehensive surveys, there are a few of the latter known from McLean County (dnr.state.il.us/ORC/list_tande_bycounty.pdf), although their presence in this watershed is not known.

Additionally, there is enough forest surrounding Lake Bloomington that a breeding bird survey is likely to find some area sensitive forest species (Herkert et al. 1993). The forest does serve as a migratory stopover site for neotropical migratory songbirds and other species.

2. Mussels:

Although found worldwide, freshwater mussels reach their highest diversity in eastern North America. Unfortunately, due to degradation of our waterways, they are among the most imperiled group of Midwestern animals. Since 1987, four surveys of the mussels of Money Creek have been performed by the Illinois Department of Natural Resources, all at one site (the area around the County Road 1975E bridge) with the last being in 2005. Due to the physical barrier to dispersal of mussels resulting from the dam for Lake Bloomington, the degradation of water quality in Money Creek, and the loss of native fishes that may have been key to the dispersal of certain species, the original complement of mussel species is likely to be no longer present. However, a cumulative total of 11 species were found in the fours surveys, including two species that are on the list of Illinois Species in Greatest Need of Conservation. Those two species are the Pondhorn (*Uniomerus tetralasmus*) and Ellipse (*Venustaconcha ellipsiformis*).

3 FISH:

In 1953 the first Department of Natural Resources (IDNR) fish survey on Lake Bloomington was completed and resulted in the collection of only 6 species. These same species are still collected in the lake today. The second fish survey was conducted in 1958 and consisted of 18 species. In the report for the second survey it was noted that siltation can be readily observed in the areas of Hickory and Money Creeks entering the lake. The biologist also stated that reproduction of smallmouth bass in this type of habitat with the presence of so many other species is not typical and therefore doubtful if smallmouth bass can be successfully managed. In the 1958 survey they collected 26 smallmouth bass. In the 2007 fish survey they collected zero smallmouth bass. Smallmouth are still present in the lake, but at a very low density.

In 1960 a fish survey report stated that a complete watershed conservation program would improve the game fish habitat of the lake. The biologist suggested using BMPs of the day for all farmland in the watershed. The survey report also stated that shoreline bank erosion should be controlled by grading back the high eroded banks, vegetative plantings and rock rip-rapping. Wave action was noted to be causing a large amount of shoreline erosion. In a 1952 State Water Survey Report, the lake was losing 0.5 percent of its storage capacity per year. Even though some BMPs have been used in the watershed, Lake Bloomington still faces the same issues as it did in 1960. (ISWS 1952)

Since 1960, there has been over 30 fish surveys completed on Lake Bloomington by IDNR personnel. These surveys have been used to set fishing regulations, recommend fish stockings, and document changes in the fish community. The first fish stocking was in 1940 and consisted of largemouth bass, bluegill, crappie, bullhead catfish, and striped bass. Since 1984 the IDNR has stocked almost 127,000 largemouth bass fingerlings, 575,000 walleye fingerlings, and 25,000 hybrid striped bass fingerlings. There have been stockings of smallmouth bass, northern pike, and white bass over the years.

The game fish populations in Lake Bloomington still have difficulties producing strong year classes and this can be attributed to the lack of quality habitat. As the water levels change so does the amount of suitable habitat for young fish. The erosion of shorelines and deposition of silt also hamper fish reproduction. Recent surveys suggest that bass and crappie are having a difficult time reproducing in the lake. The stocking of largemouth bass failed to increase the number of bass in the lake. Suitable littoral habitat is needed to bolster game fish populations in Lake Bloomington.

Fishing regulations have been used to regulate fishing pressure and the number and size of fish harvested. Lake Bloomington currently has fishing regulations for bass, bluegill, hybrid striped bass, white bass, and crappie. Fishing pressure can be determined from creel surveys and these were conducted in 1996 and 2003. Almost every major game fish showed an increase in catch rates and harvest rates from 1996 to 2003. Even though catch rates improved for anglers during the creel surveys, catch rates during the 2007 fish survey did not meet management objectives for most game fish. Only the catch rate for largemouth bass met the management objective.

Money Creek was surveyed by IDNR during intensive basin surveys four times between 1987 and 2005 (Table 1). The number of fish species collected ranged from 13 in 2000 to 19 in 2005. Carp, quillback, and bluegill were collected in 2005 and not during the previous surveys. These species are found in Lake Bloomington and will move from the lake upstream into Money Creek. Catch rates for spotfin shiner, orangethroat darter, and fantail darter have declined over the 4 surveys. These species are indicators of good habitat and water quality.

The Index of Biotic Integrity (IBI) was developed to assess the quality of streams using fish species collected during surveys (Smogor 2000). The IBI score is based on 10 matrices that were developed for different regions across Illinois. With each region comprising a unique set of matrices, the IBI score better reflects the effect of human disturbance on fish. The IBI scores obtained during the intensive basin surveys ranged from 24 to 30 (Table 1). The highest score obtainable is 60. The score of 60 represents a stream that has characteristics of the benchmark conditions set to develop the IBI. The benchmark conditions reflect the biological conditions expected in Illinois streams least disturbed by human impacts. Therefore, the degree to which an IBI score deviates from the maximum score reflects the relative amount of human impact additional to that already represented by the reference conditions. The developers of the Illinois IBI suggested that a score difference of 10 or less should not be interpreted as a meaningful difference in biotic integrity (Smogor 2003). The IBI scores of 24 to 30 put Money Creek into the low category of biotic integrity (Table 2). Only minor changes in a few fish species can be seen from 1987 to 2005, which has kept the biotic integrity of Money Creek low.

Table 2: IBI score description		
IBI-Score Subrange	**Biotic Integrity Class**	**Description of Typical Biological, Physical, and Chemical Conditions.**
56-60	Moderately High	Values of fish metrics are very similar to values expected in Illinois streams where levels of human impact appear to be least in the state.
46-55	Moderate	Number of native fish species is reduced primarily due to loss of intolerant species. Reduced abundances of mineral-substrate spawners indicates disruption of reproductive functional structure.
31-45	Moderately Low	Number of native fish species is reduced further primarily due to further loss of intolerant species, but also due to loss of sucker species and benthic-invertivore species. Reduced abundances of specialist benthic invertivores and increased abundances of generalist feeders, indicate imbalance in trophic functional structure.
16-30	Low	Number of native species is reduced further due to near-complete loss of intolerant species and further pronounced loss of sucker species and benthic-invertivore species. Disruption of fish-community structure is evidenced as indiscriminate loss of species across major families (minnows, suckers, sunfish). Further reductions in abundances of specialist benthic invertivores and mineral-substrate spawners indicates disruption of trophic and reproductive functional structure.
0-15	Very Low	Number of native species is reduced further due to pronounced, indiscriminate loss of species across major families (minnows, suckers, sunfish) with a concurrent increase in the proportion of tolerant species. Intolerant species are absent; benthic-invertivore species are nearly absent. Pronounced reductions in abundances of specialist benthic invertivores ans mineral-substrate spawners indicate further disruption of trophic and reproductive functional structure.

No threatened or endangered fish species were collected from Money Creek during these surveys, nor is there evidence to suggest the presence of threatened and endangered fish species in Money Creek

Table 1. Fish collected during four basin surveyed conducted on Money Creek, Mackinaw River Watershed between 1987 and 2005.

		Money Creek	Money Creek	Money Creek	Money Creek
		07/29/87	09/08/94	07/20/00	07/11/05
Common name	Scientific name	DKP-02	DKP-02	DKP-02	DKP-02
Carp	*Cyprinus carpio*				1
Creek chub	*Semotilus atromaculatus*	205	81	22	39
Hornyhead chub	*Nocomis biguttatus*	77	54	6	88
Central stoneroller	*Campostoma anomalum*	15	6	6	12
Suckermouth minnow	*Phenacobius mirabilis*		7		4
Striped shiner	*Luxilus chrysocephalus*	29	52	8	164
Redfin shiner	*Lythrurus umbratilus*	15	4	12	31
Spotfin shiner	*Cyprinella spiloptera*	18			
Red shiner	*Cyprinella lutrensis*	41	5	83	117
Bluntnose minnow	*Pimephales notatus*	336	103	17	311
Bigmouth shiner	*Notropis dorsalis*	163		2	311
Sand shiner	*Notropis ludibundus*	73	10	45	194
Quillback	*Carpiodes cyprinus*				9
Smallmouth buffalo	*Ictiobus bubalus*		2		
White sucker	*Catostomus commersoni*	2	83	7	45
Golden redhorse	*Moxostoma erythrurum*				16
Yellow bullhead	*Ameiurus natalis*	16	6		5
Stonecat	*Noturus flavus*	1	1		1
Blackstripe topminnow	*Fundulus notatus*			1	5
Bluegill	*Lepomis macrochirus*				2
Johnny darter	*Etheostoma nigrum*	32	15	10	37
Orangethroat darter	*Etheostoma spectabile*	2	6	4	
Fantail darter	*Etheostoma flabellare*	7	3		
Total fish		1032	438	223	1081
Total species		16	16	13	18

Table 1. Fish collected during four basin surveyed conducted on Money Creek, Mackinaw River Watershed between 1987 and 2005.					
Totals		Money Creek 07/29/87 DKP-02	Money Creek 09/08/94 DKP-02	Money Creek 07/20/00 DKP-02	Money Creek 07/11/05 DKP-02
Electrode minutes		30	35.73	30	27.5
Kilograms of fish		1.38	1.977		18.635
Native fish species		16 (3)	16 (3)	13 (2)	17 (3)
Native minnow species		10 (6)	9 (5)	9 (5)	9 (5)
Native sucker species		1 (2)	2 (3)	1 (2)	3 (3)
Native sunfish species		0 (0)	0 (0)	0 (0)	1 (1)
Benthic invertivore species		5 (3)	6 (4)	3 (2)	4 (2)
Intolerant species		1 (2)	1 (2)	1 (2)	1 (1)
Prop. specialist benthic invertivores		0.04 (2)	0.05 (2)	0.06 (2)	0.05 (2)
Prop. geneneralist feeders		0.87 (2)	0.79 (3)	0.88 (2)	0.85 (2)
Prop. mineral-substrate spawners		0.13 (2)	0.29 (3)	0.16 (2)	0.29 (3)
Prop. tolerant species		0.31 (5)	0.31 (5)	0.31 (5)	0.35 (4)
Extrapolated IBI		27	30	24	26

Human Use

Social and Economic Characteristics

The population of McLean County is 161,202. The two largest communities in McLean County are the City of Bloomington (pop. 74,975) and the Town of Normal (pop.

50,519). Both of these municipalities are in the southern part of the watershed. In 2007, the McLean County labor force was 91,382 with 87,926 employed and 3,456 unemployed or a 3.8% unemployment rate. The largest employer is State Farm Insurance Company with 15,297 employees. The median income for McLean County for FY 2008 is $70,900. (EDC, 2008)

East Bay Camp

East Bay Camp started in 1929 when Lester Martin, an attorney from the Bloomington Water Company, approached the Reverend Frank Breen. According to Breen, Martin said, "...since our first plan for the lake, we decided to raise it five feet and we had to buy an extra 40 acres. There'll be a lot of ground back in here and I think it would be wonderful for a camp. Do you think you could start a camp here?"

Today, East Bay Camp lies on 146 acres and has 87 buildings. The most recent major addition is the Seager-Denham recreation center. The indoor pool is used by campers in the summer and by Lake residents year-round for water exercise classes. (LBA 2007)

East Bay Camp was given a WLA for their discharge into Lake Bloomington for both phosphorus and nitrates. This is based on the facility's Design Average Flow (0.03 mgd) multiplied by an assumed concentration of 3.5 mg/L total phosphorus. While the concentration is a best guess, it is known, through reporting requirements, that this facility has always discharged less than their Design Average Flow (average discharge of 0.018). There is potential that during the reissuance of their NPDES permit (expires Dec 31, 2009) they could be required to report their monthly phosphorus concentrations. Once this is known, a more accurate determination of their phosphorus load can be made.

Timber Pointe Outdoor Center

The camp now known as the Timber Pointe Outdoor Center was founded over 60 years ago, soon after the Lake was built. The camp has 170 acres of woods and four miles of shore line.

It served as the Corn Belt Council Boy Scout Camp until 1989, when it was purchased by the Easter Seals Rehabilitation Center, Inc. In 2005, 1700 children with special needs attended the camp.

In 2006, The Lodge at Timber Pointe was completed as a joint project between the four Bloomington-Normal Rotary groups and the Timber Pointe Charitable Foundation. The complex has a kitchen and dining areas, a medical facility and lodging for the medical staff, a storm shelter, program and assembly areas, and camp administration and support services.(LBA 2007)

Camp Peairs

Camp Peairs was built as a camp for Girl Scouts in early 1940. It has been improved over the years, and in a recent summer, over 1300 Girl Scounts attended the camp. (LBA 2007)

Construction of Lake Bloomington

The Lake Bloomington watershed consists of approximately 43,100 acres (~ 70 square miles) in the central part of McLean County, Illinois. The watershed encompasses hydrologic unit 16, Upper Money Creek and the majority of hydrologic unit 09, Lower Money Creek. Money Creek flows from the southeast to the northwest in the watershed and is a tributary of the Mackinaw River (Mackinaw River Basin, Hydrologic Unit Code 07130004). Portions of the City of Bloomington, Town of Normal, Merna, Towanda and unincorporated rural subdivisions also are located in the watershed.

Lake Bloomington is located in the northern part of the watershed. It was constructed in 1929 by the impoundment of Money Creek. Hickory Creek is a tributary of Money Creek which also empties into Lake Bloomington. The lake was constructed to expand the water supply for the City of Bloomington. A secondary use for Lake Bloomington is recreation activities.

In 1958 the City of Bloomington raised the dam to increase the normal pool elevation by 5 feet resulting in a 56% increase in storage capacity. The increase in pool elevation resulted in a volume increase from 4710 acre feet to 7380 acre feet. A 1999 Hanson Engineering sedimentation survey yielded a volume of 6798 acre feet. Lake Bloomington, as of 2007, has a surface area of 572 acres, 9.5 miles of shoreline, a maximum depth of 35 feet, a mean depth of 12.9 feet, and a storage volume of 6768 acre feet.

Recent issues

Pending Pipeline Construction

One of the recent topics is a proposed crude oil pipeline. This pipe would be a 36” in diameter pipe capable of transporting 400,000 barrels of crude oil per day. In the future it could be increased to 800,000 barrels per day by adding pumping stations to the route and increasing the pressure of the liquid. The proposed corridor is 60’ in width to allow for additional pipes to transport refined petroleum products, additional crude or any other products. The proposed pipeline enters the watershed 3 miles east and 3.5 miles south of the entrance to the lake. It continues south through the watershed for 6 miles, at a depth of not less than 5 feet to the surface where practical.

The effects of this pipe could include:

- Damage to tile that feed into the Money Creek.
- Additional sedimentation until the ground has an opportunity to regain its structure and cover.
- Contamination of soil in the watershed from a leak.
- Contamination of subsurface aquifers and surface streams.

East Side Highway and Other Roads

Introduction.

Land use changes within a watershed can have significant effects, positive or negative, on the ability to: 1) predict the future delivery of TMDL pollutants into impaired streams and lakes, 2) evaluate the choice and likely effectiveness of Best Management Practices (BMPs) to reduce TMDL pollutants, and 3) assess the future overall ecological health of a watershed. One category of land use change that can alter significantly a watershed, through both direct and indirect effects, are roads (Forman and Alexander 1998, Forman et al. 2003).

Interstate-type roads often have the largest impacts due to the size of their direct and indirect ecological footprints, and due to their magnet effect on future growth. In the context of the Lake Bloomington/Money Creek watershed, an important direct effect of a major road is the potential increase in sedimentation and runoff, both of which can contribute to sediment and other pollutant loading into Lake Bloomington. An indirect effect of a major road would be the potential for conversion of agricultural to urbanized land. This conversion would change the relative percentages of major land use and thus would affect the current modeling of inputs of TMDL pollutants into Lake Bloomington.

East Side Highway Corridor.

Currently, one interstate (I-55) traverses the Lake Bloomington/Money Creek watershed, roughly through the middle portion. A second major road that would link I-55 to I-74 has been proposed for examination in various studies over the years and, if built, would include part of the Lake Bloomington/Money Creek watershed.

The first recommendation for examining a "parallel freeway or expressway between I-74 and I-55" was in 1994 (*Long Range Transportation Plan for the Bloomington-Normal Urbanized Area*). Subsequent plans included the recommendation for this examination in 1999 (*2025 Long Range Transportation Plan*) and 2000 (*McLean County Regional Comprehensive Plan*).

These recommendations led to a cooperative effort by Bloomington, Downs, Normal, Towanda, McLean County and the Illinois Department of Transportation, administered by the McLean County Regional Planning Commission, to hire Bernardin, Lochmueller & Associates, Inc. of Charleston, Illinois, for a study. They produced the *2002 East Side Corridor Feasibility Study Final Report* which can be found at the website www.mcplan.org/tran/eastside/ecfs.shtml. The project goals included the evaluation of "the effectiveness of the build alternates relative to each other and the no build alternative". For the evaluation of the build alternatives, they assumed "a four-lane rural freeway...that is typical of interstate facilities in McLean County as well as throughout the State of Illinois".

Key conclusions of the 2002 study were that 1) there is a significant identified need, and 2) the preferred corridor (of 5 examined) is Alternate C. Alternate C passes through the central southwest portion of the Lake Bloomington/Money Creek watershed. An environmental profile was performed and used to compare the advantages and disadvantages of alternate corridors. The effect on TMDL pollutant loading was not one of the impacts examined at that time.

A Phase 1 engineering study began in late 2006. This effort is a partnership among Bloomington, Normal, McLean County, the Illinois Department of Transportation, and the Federal Highway Administration (FHA) and it is called the East Side Highway Corridor Study (www.eastsidehighway.com/). The company, Clark Dietz, Inc. of Champaign, Illinois, was hired to perform this study. The goal is to start afresh in assessing three parameters: 1) the need for a transportation facility; 2) the type of transportation facility, if it is determined that it is needed; and 3) the location within the study area of a corridor of 300-500 feet in width, if it is determined that it is needed.

The study area for the Clark Dietz study has been expanded from the 2002 study to include an area between I-55 and I-39 north of Normal and between I-74 and Highway 51 south of Bloomington (see map within the East Side Highway Corridor Study web site:

www.eastsidehighway.com/index_files/pdfs/Corridor%20Study%20Limits.jpg).

This study area includes the entire central third of the Lake Bloomington/Money Creek watershed and also extends into the Evergreen Lake watershed. The final report from Clark Dietz is scheduled for Spring 2008.

The Clark Dietz study incorporates a new FHA standard called Context Sensitive Solutions (CSS). This process allows for involvement of all stakeholders in all phases of study design and data collection, although the final report and recommendations will be the product of Clark Dietz. Although a full Environmental Impact Study will result should a transportation corridor be recommended, the Clark Dietz CSS process has included assembling comments from stakeholders regarding environmental issues that should be considered, including potential impacts on TMDL pollutant loading into Lake Bloomington.

Other Road Projects.

Of the major road projects listed in the draft *Long Range Transportation Plan 2035 for the Bloomington-Normal Urbanized Area*, the only one within the Lake Bloomington/ Money Creek watershed is the widening and upgrade of Towanda-Barnes Road north from Fort Jesse Road to the Village of Towanda. No evaluation has been made of the direct or indirect effects of this project on the watershed. However, it is likely to increase the conversion of the watershed from agricultural to urbanized land use and may have other impacts as identified in the introduction to this section. This should be included in any future modeling efforts of TMDL pollutant loads.

Smaller road projects, including bridge work, are likely on county roads within the watershed. Examination should be done of the current and future planned utilization of soil erosion BMPs in such projects. Also, proposals for these and other road-related maintenance and upgrade projects should include assessment of impacts on TMDL pollutants, both by the individual project and in terms of the cumulative impacts when all projects are considered together.

Twin Groves Wind Farm

Beginning in 2006, a noticeable land use change started in the southeasternmost portion (south of Route 9) of the Lake Bloomington/Money Creek watershed with the construction of the Horizon Wind Energy's Twin Groves Wind Farm. When completed in 2008, the wind farm will consist of 240 turbines producing 400 megawatts of power, making it the largest wind facility east of the Mississippi River. In addition to the turbines, there will be access roads, operations facilities, and substations. Although it is difficult to precisely determine the placement of all facilities within the irregular boundaries of the watershed, maps indicate that approximately 40 turbines along with supporting access roads, substation(s) and transmission lines will be in this watershed. However, the majority of the wind farm will be located south and east of this watershed.

The placement of wind turbines will not change greatly the existing agricultural land use of the watershed because each turbine + access road will replace only one-half acre of farmed land. Some additional displacement of farmed land will occur with the substation(s), transmission lines and other infrastructure support.

A temporary increase in sedimentation that can carry TMDL pollutants will result from upgrading the county roads to handle movement of the large equipment as well as construction of the turbine platform and graveled access road through each field. In terms of the platform and access road construction, the company has an NPDES permit and a SWPPP plan using best management practices for soil erosion control.

It is likely that the presence of these turbines will inhibit the conversion of this portion of the watershed from agricultural to urbanized, thus keeping it under current land use. This is because: 1) there is a minimum distance of 1,500 feet required from the wind turbine to any residence, and 2) the stable farm income resulting from hosting a wind turbine may reduce the pressure on landowners to sell farmland for urbanized development. Therefore, it seems unlikely that there will be any direct long-term effects on the delivery of TMDL pollutants to Lake Bloomington/Money Creek resulting from this wind farm.

Watershed Activities

In 2003, Both the City of Bloomington and the Town of Normal were required to submit storm water management plans in accordance with United States Environmental Protection Agency law. These documents were prepared jointly between the two communities and outline programs to develop, implement and enforce storm water management practices designed to reduce the discharge of pollutants to the maximum extent practicable, to protect water quality, and to satisfy the appropriate requirements of the Federal Clean Water Act in accordance with the USEPA Phase II program. These plans address six minimum control measures as required by state regulations:

- Public Education/Outreach
- Public Participation/Involvement
- Illicit Discharge Detection/Elimination
- Construction Site Runoff Control
- Post Construction Runoff Control
- Pollution Prevention/Good Housekeeping

These storm water management plans present a mix of best management practices within each control measure to address erosion, sediment, fecal coliform, grease and oil, household and lawn/garden chemicals that could potentially end up in local streams.

Public awareness and educational activities in the watershed include:

- Earth Express- a county wide activity for 3rd and 4th graders.
- Conservation Day- 3rd graders
- Wilderness Camp- 5th through 8th graders
- Yard Smart- a county wide campaign to encourage pesticide free and wildlife friendly yards
- Wellness and Sustainability Fair at Illinois Wesleyan University
- Ecology Action Center- provides ecology and recycling programs for all grade levels and McLean County at large
- Lake Fest- Family oriented single day special event providing presentations and demonstrations of Fisheries Management, Aquatic Vegetation, shoreline/streambank erosion control techniques, and lake related outdoor activities.

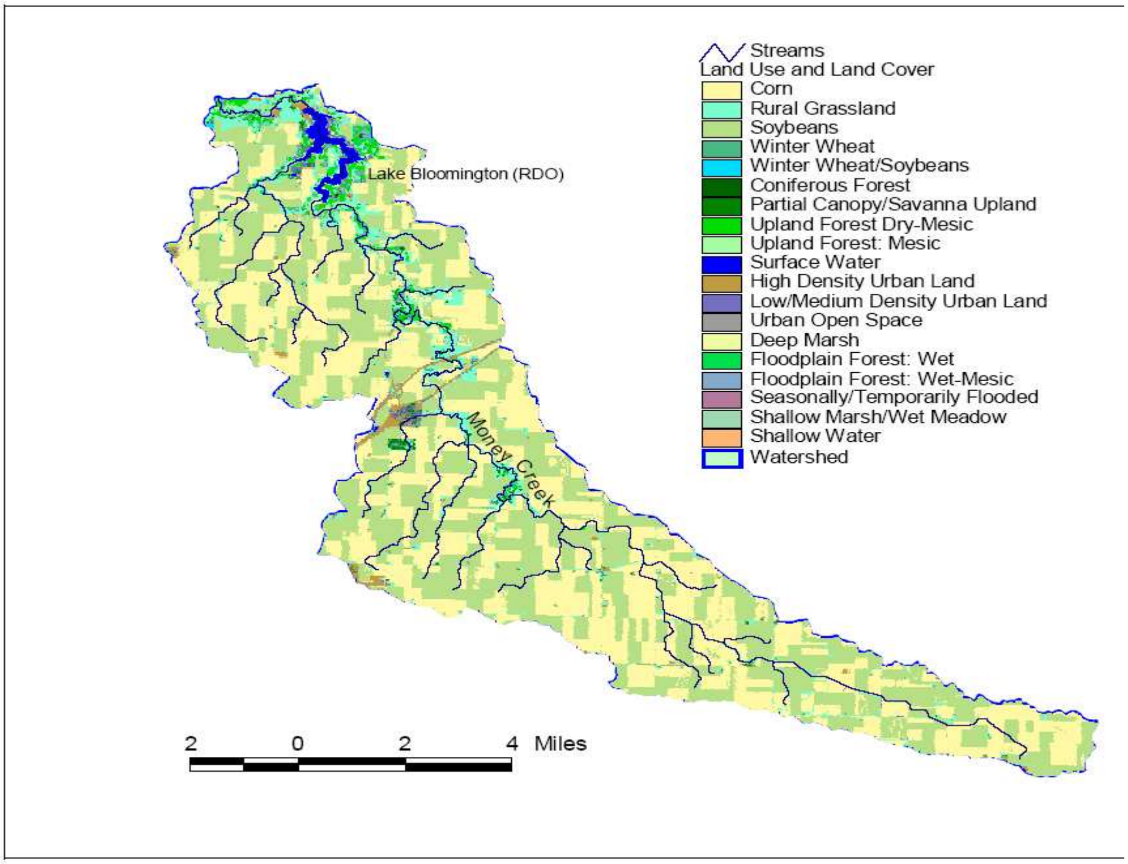
- Storm Drain Stenciling
- Lake Smart activities:
- Clean Water School Program at Hudson, Carlock and Towanda Elementary schools
- Lake Smart Workshops targeting residents
- Raingarden Workshop
- Yard Smart Walk
- Lake Festival
- Production of Living on the Lake Handbook and brochures
- Production of watershed displays

Large management and research projects include:

- Nutrient Management Programs
- 2000/01, 2001/02 Funded by IEPA
- 2005/06, 2006/07 Funded by Sand County Foundation
- Lake Bloomington Sustainable Water Program- Tile research Hoffman/Troyer farm- City of Bloomington sampled and Illinois State University compiled data from 1998 to date
- Wetlands Research- Dr. David Kovasic from the University of Illinois conducted research on City of Bloomington property from 2000 to date
- Nitrate Research on Money Creek- Recording and compiling data on tiles, organic use, pond data done by the City of Bloomington and ISU from 1992 to date
- Rain Reporters- volunteers who collect data on rainfall in McLean county 24/7 from 1997 to date

Watershed Resource Inventory

Land Uses



Land Use and Cover Map

The majority of land in the Lake Bloomington watershed is used to grow row crops, with soybeans covering 50 percent of the land and corn covering 33 percent, according to the McLean County SWCD transect survey in 2007. Rural grassland, high density (urban), and surface water each cover less than ten percent of the total surface area. The T- transect has been conducted by the McLean County Soil and Water Conservation District for the whole county biannually since the mid 1990's to give a statistically accurate gauge of the acres in conservation tillage for the primary crops in the county. The same route is completed each time in early June with a determination of which crop is growing, how much residue is left on the field and if no-till, strip till, mulch till or minimum tillage is used to establish the growing crop. This information when combined with the soil types and slopes in each field gives an estimate for the field if it is above or below the Tolerable soil loss or "T" hence the name T-transect.

In a 2007 inventory of the Lake Bloomington watershed conducted by the McLean County SWCD there were 286 cattle and 128 other livestock animals in 25 operations in the area, a number likely to have declined over the years. This is a relatively low livestock density and therefore does not represent a high priority source.

Land Cover Description	Watershed Area	
	Acres	Percentage
AGRICULTURAL:		
Corn	19,095.0	42.72
Soybeans	19,439.9	43.5
Rural Grassland	3,076.2	6.88
Winter Wheat	45.8	0.1
Winter Wheat/Soybean Double Cropped	9.3	0.02
Subtotal	**41,666.2**	**93.2**
URBAN:		
High Density	780.2	1.75
Low/Medium Density	263.3	0.59
Open Spaces	72.5	0.16
Subtotal	**1,116.0**	**2.5**
WETLAND:		
Floodplain Forest	325.8	0.73
Seasonal/Temporarily Flooded	21.6	0.05
Wetland: Shallow Water	11.8	0.03
Shallow Marsh/Wet Meadow	2.7	0.01
Deep Marsh	6.2	0.01
Dry Mesic Forest	482.2	1.08
Floodplain Wet Mesic	252.2	0.56
Subtotal	**1,102.5**	**2.5**
Forest:		
Partial Canopy/Savanna Upland	281.6	0.63
Coniferous	13.3	0.03
Upland	85.2	0.19
Subtotal	**380.1**	**0.9**
OTHER: Surface Water	428.8	0.96
Total	**44,694.2**	**100**

Data Date: 2000

The entire watershed lies within the Till Plains Section of the Central Lowland Province physiographic area. It is specifically located in the Bloomington Ridged Plain which is the unit that is more rolling and contains most of the Wisconsin glacial moraines located in Illinois. The El Paso Moraine lies to the northeast of the lake and this low ridge helps to funnel water into this watershed and direct it toward the lake. In most areas, Peoria Loess overlies glacial till of the Delavan Member of the Tiskilwa Formation of the Wedron Group (Wisconsin) that is generally loam or clay loam in texture. The Delavan Member is a brownish gray till that is calcareous and contains lenses of gravel, sand, silt and clay. The loess ranges from 4 to 6 feet in thickness over the general area, but can be thicker along the broad ridge tops and thinner on the eroded side slopes. Stream and gully dissection has exposed the underlying calcareous glacial till in a few areas along Money Creek and the major drainage ways.

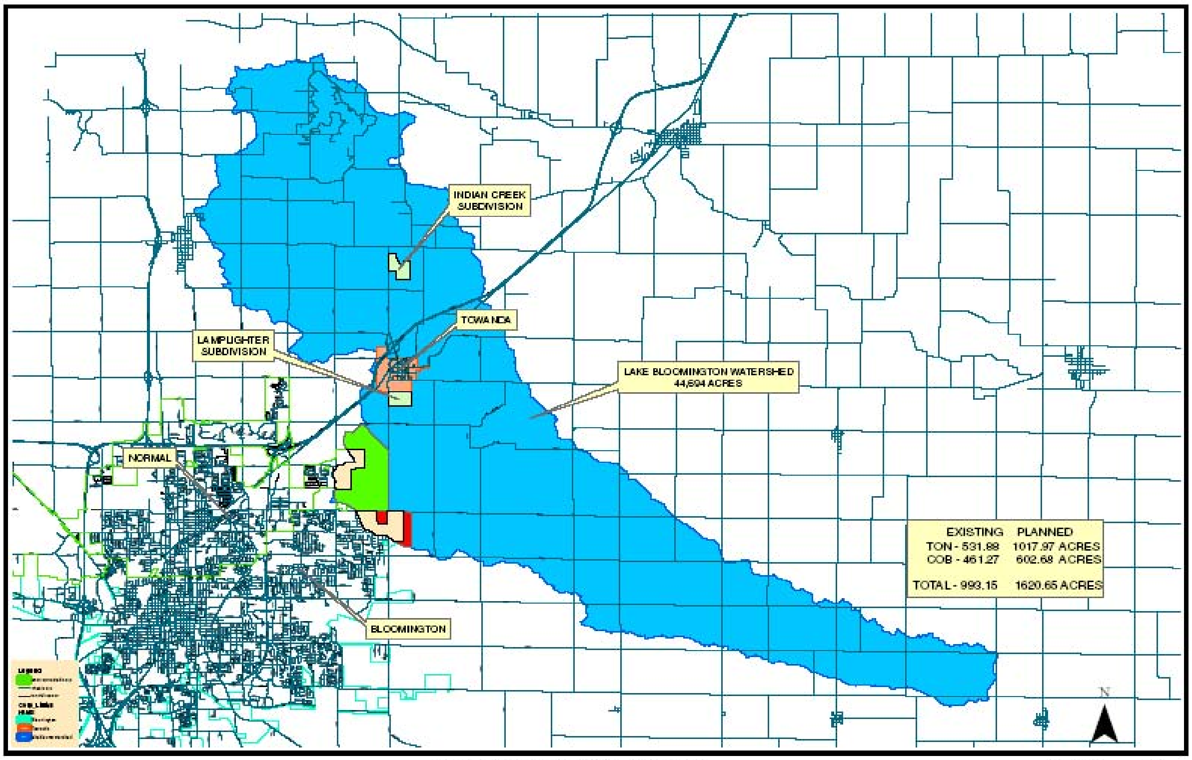
The major stream valley is composed of deposits of Cahokia Alluvium (old) that is generally less than 20 feet thick. Sandy deposits of the Henry Formation can be below the alluvium along Money Creek but glacial till is probably below the alluvium on the upper reaches of the streams or where smaller tributaries join the main drains as they exit from the surrounding uplands. On the steeper slopes, where erosion has been more intense, the glacial till is occasionally exposed. Soils mapped in this watershed reflect the parent material differences discussed above. The surface texture of the soils in greater than 80% of the watershed is a silt loam, reflecting the characteristics of the loess cover that blankets nearly the entire region. The loess is quite erosive and is easily removed by running water. The alluvium in the stream banks can contain a variety of materials with a variety of textures and grain size content. This is especially noticeable where stones are present in the channel. Stability of the stream banks is greatly dependent on the shear characteristics of the material, and on a *watershed* scale, it is difficult to make “general” statements about overall conditions. Site specific determinations are essential for future stream bank stabilization activities. (Windhorn-Appendix III)

The most common soil type in the watershed is Sable silty clay loam, which is a byproduct of the windblown silt, called loess, distributed during glacier retreat. This soil has slow infiltration rates and a high clay content, as well as poor drainage with high runoff levels. The second most common soil is Ipava silt loam.

Subsurface drainage, or tiling of fields, is practiced to remove excess water from the soil. Drainage tiles are installed below the root zone and release the water into a ditch or stream. In Illinois, tiles are usually installed at a depth of 3 to 4 feet and 80 to

120 feet apart. Based on the amount of soil classified as poorly drained, the McLean County SWCD estimates that 7500 acres in the watershed are tiled.

Effects of Urban Development



TOWN OF NORMAL / CITY OF BLOOMINGTON
EXISTING & PLANNED GROWTH LANDUSE IN LAKE BLOOMINGTON WATERSHED

The majority of non-agricultural use within the Lake Bloomington Watershed is confined to far eastern edges of the Town of Normal and City of Bloomington. Other significant pockets of non-agricultural land use include the Village of Towanda, northern portions of 1800 East Road and long-established residences around Lake Bloomington. Forested areas and natural grasslands are severely limited except around Lake Bloomington itself and a small pocket that sits within the middle of the watershed.

Urban development within the watershed will continue as the Town of Normal and the City of Bloomington continue to expand east and northeast toward the Village of Towanda. Sanitary sewer extension along Pipeline Road may also encourage additional development expansion that has already taken place near the Ironwood Development and north.

There are approximately 1,490 dwellings in the Lake Bloomington Watershed as found in the 2006 aerial photo. There were approximately 976 dwellings in the watershed as found in the 1994 aerial photo. This is an increase of 514 dwellings (52.7%) over this twelve year period of which 416 of these additional dwellings were built within the Bloomington/Normal urban area. Sanitary sewer effluent from these Bloomington/Normal dwellings discharges to the Bloomington Normal Water Reclamation District (BNWRD) through public sewer collection systems.

Lake Bloomington Community

There are approximately 206 dwellings located within 300 feet of Lake Bloomington as shown in the 1994 aerial photo; there are 215 dwellings shown in the 2006 aerial photo. This is an increase of nine dwellings (4.4%) in this twelve year period.

Existing development surrounding the Lake consists primarily of residential with a few commercial establishments. Some of the main commercial establishments within this Lake community include the City of Bloomington Water Treatment Plant, two restaurants and Davis Lodge. The developed area is surrounded by agricultural land. The City of Bloomington owns all lands adjacent to the lakeshore and leases lots to homeowners.. Originally, homes were summer cottages but most have been remodeled or rebuilt to permanent homes. The City of Bloomington provides water service via publicly owned and operated water treatment and distribution system. Water services are metered and customers are charged a rate for water according to usage. (Farnsworth Group, December, 2003)

The Lake Bloomington area has no centralized sewer system or wastewater treatment/transfer facility. Each home on the Lake is responsible for its own wastewater treatment. Most homes have individual septic systems, which includes a septic tank discharging into leaching fields, sand filters, existing field tiles, cisterns, and/or in a few instances directly into Lake Bloomington. All septic systems ultimately discharge effluent to Lake Bloomington either through direct surface discharge or seepage to groundwater that reaches the Lake. Some homes have entire septic systems (septic tank and sand filter/leach field) on their property. A number of homes, which are built close together and/or have relatively small lots, have a septic tank on the property but have a leaching field or sand filter on adjoining City-owned property (Farnsworth Group, December', 2003)

The McLean County Environmental Health Department keeps a comprehensive record of location, condition, and number of septic systems in the County, including Lake Bloomington and the surrounding area. (Farnsworth Group, December, 2003)

A study conducted in 2003 by the City of Bloomington produced several alternative methods for providing conveyance and treatment of the wastewater generated by residences and public facilities surrounding the lake. The study presented a pressure sewer collection/conveyance system as being the most cost effective at a cost of $6,400,000 in 2003 dollars. Lagoons in two forms, aerated and covered with aeration, were considered to be the most cost effective means of giving treatment with a cost of an additional $3,400,000.

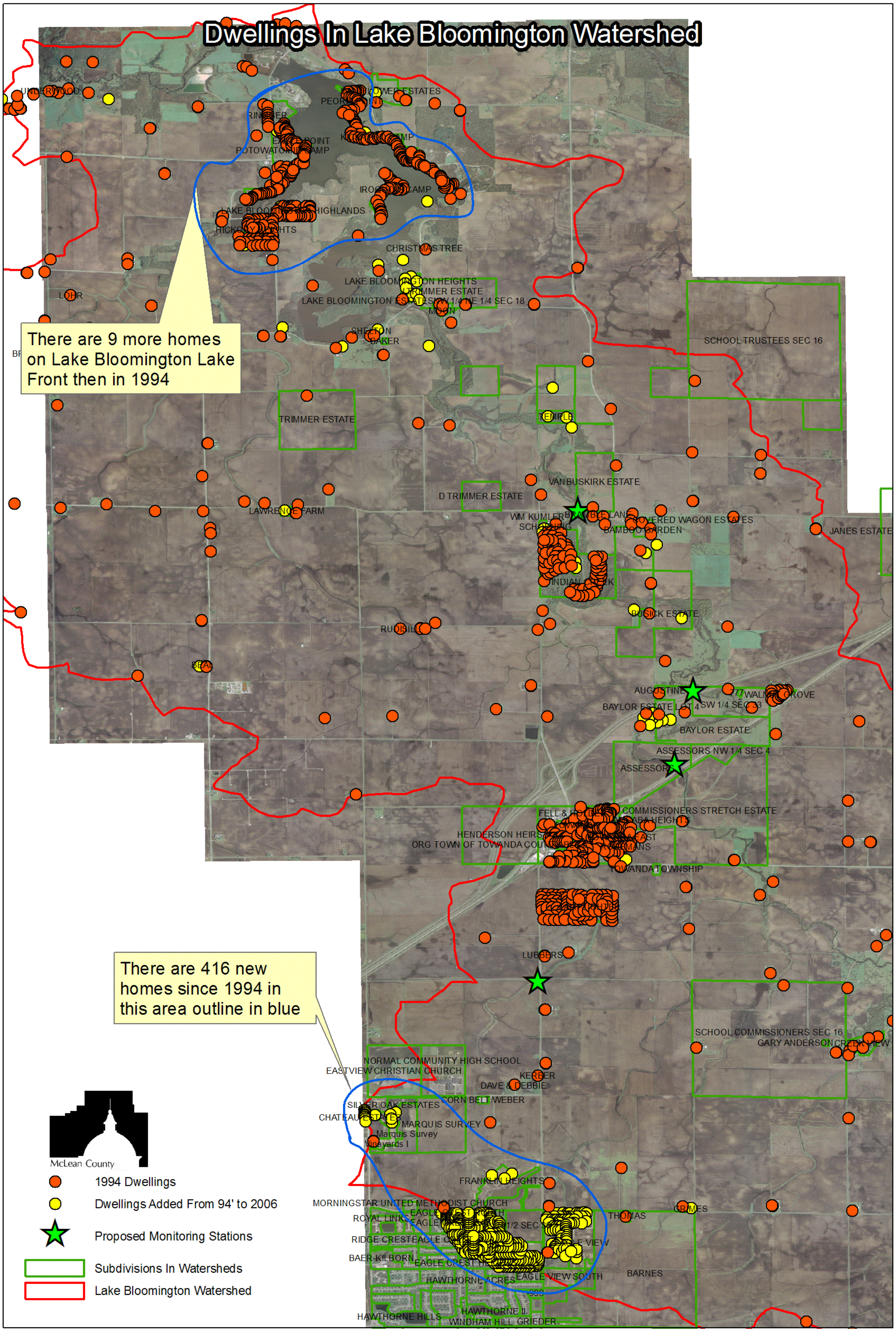
The second least costly option produced by the study was dependent upon construction of a pumping station by the Bloomington and Normal Water Reclamation District. This option involved pumping wastewater from the Lake Bloomington pressure collection system to a pump station owned by the Bloomington and Normal Water Reclamation District. The wastewater would then be pumped to the District's Southwest Treatment Plant. The estimated cost for this addition to the collection system resulted in a total cost of $10,900,000.

Rural Communities and Subdivisions

The County Comprehensive Plan does not show areas of medium to high density for development in the Lake Bloomington Watershed except where adjacent to Bloomington/Normal and Towanda. Erosion control regulation in the unincorporated area of the county is triggered by the Subdivision Ordinance. The County is not likely to approve subdivisions where such development is inconsistent with the Comprehensive Plan.

In addition to the 416 dwellings in Bloomington/Normal and the nine dwellings adjacent to Lake Bloomington, there was a net increase of 89 dwellings (9.1%) over the remainder of the watershed over the same 12 year period.

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating "point sources" that discharge pollutants into water bodies. These include, but are not limited to, pipes and man-made ditches or ravines. Residences that are connected to a municipal discharge system, use a septic system or do not have surface discharge do not need an NPDES permit. However, industrial, municipal and other facilities must obtain permits if discharges from the facilities are released directly into surface waters. By and large, the NPDES program is administered by authorized states. Since its introduction in 1972, the NPDES permitting program has resulted in significant improvements in water quality. *(U.S. Environmental Protection Agency – Office of Wastewater Management, 2007)* The number of active NPDES permits is sometimes an indicator of growth. As of 2007, more than 400 NPDES permits have been issued for McLean County, Illinois.



Dwellings In Lake Bloomington Watershed
There are 9 more homes on Lake Bloomington Lake Front then in 1994
There are 416 new homes since 1994 in this area outline in blue
McLean County
1994 Dwellings
Dwellings Added From 94' to 2006
Proposed Monitoring Stations
Subdivisions In Watersheds
Lake Bloomington Watershed

Bloomington and Normal Urban Expansion

Approximately 993 acres or 2.2% of the total watershed area has been annexed either to the City of Bloomington or the Town of Normal and has been developed or is currently under development. Current comprehensive planning studies for both communities project that the total urban area within the watershed will increase to 1620 acres or 3.6% of the total watershed area by the year 2035. (See Map Above)

Lake Bloomington Community Survey

On August 30, 2007 a survey was conducted at the annual dinner meeting of the Lake Bloomington Homeowners Association. The members were surveyed on their personal lawn fertilizer use. Out of 200 households, 70 responded. Results as follows:

Occupancy:

- 54 were full time residents
- 10 were part time
- 6 did not indicate

Lawn fertilizer use:

- 19 (27%) do not fertilize
- 21 (30%) fertilize less than once per year
- 35 (50%) fertilize at most once per year
- 17 (24%) fertilize 3 or 4 times per year

Water Usage:

Even though lake residents can pump water from the lake for no charge:

- 14 of 57 responses (24%) never water grass
- 26 of 57 responses (46%) water rarely or never

Using Lake Friendly Lawn Care:

- 51 of 66 (77%) are interested in learning about lake-friendly fertilizers
- 45 of 56 (80%) would pay more for it
- 13 of 17 (76%) of those who fertilize 3 or 4 times a year would like to learn about lake-friendly fertilizers
- 11 of these (85%) would be willing to pay more for it

Lake Bloomington Shoreline Erosion

Lake Bloomington has 55,580 feet of shoreline. Areas of Lake Bloomington shoreline are eroding at significant rates resulting in loss of land and unsightly areas. Three shoreline erosion surveys have been completed in the past twenty years on Lake Bloomington. In 1989, a field reconnaissance survey of Lake Bloomington's shoreline was completed as part of the Report on Drought Emergency Water Sources and Options to Improve Existing Lake Supplies for the City of Bloomington, IL by Farnsworth & Wylie/Hanson Engineers. Roger Windhorn, NRCS Resource Soil Scientist, also completed a Shoreline study in 1998. The most recent and in-depth analysis was completed in November 2005 by Midwest Streams, Inc. under contract to the City of Bloomington.

Visual observations were made by Midwest Streams, Inc. of the Lake Bloomington Shoreline in October, 2005 by walking the shoreline with the water level approx. 10 to 12 feet below normal pool. In addition to the visual observations around the entire lake, a survey along the park extending along the North Shore near the spillway has been completed for approximately 2900 feet. The survey shows nearly vertical eroding bank heights ranging from only 1 or 2 feet up to 10 to 12 feet. This survey allows for more accurate calculations of potential solutions and cost estimates that can then be used as a guide to other eroding sites around the Lake Bloomington shoreline.

The shoreline erosion has been classified in 6 categories based on the bank height and the width of eroded cobble material left in the wake of the receding bankline. Classes are related to bank height and amount of erosion, with class one being the lowest erosion and class six the most severe. This method of classification is based on two assumptions. First, the height of the eroding bank generally increases as the bankline recedes resulting in more sediment being contributed by these sites due to the increased bank height. The assumption being that the rate of erosion is determined by the combination of soils, the wave generation from long fetches, prevailing wind directions, and boat traffic. Therefore even though the bank heights are higher and the sediment contribution larger, the rate will stay fairly constant as long as these four factors remain constant.

Second, the cobble material eroded from the glacial till is too heavy to be transported by wave action and remains near the receding bankline. The width of the heavy cobble material left in the wake of eroding bankline therefore is a guide to the rate of past erosion. Based on the first assumption, then it is also a guide to the likely future erosion rate. One unknown factor could be the varying content of heavy cobble within the eroding bankline, however there seems to be no visual indication that there are significant changes within the glacial till and Roger Windhorn, Resource Soil Scientist with NRCS confirmed that the cobble content would not be expected to vary within the till surrounding Lake Bloomington.

Therefore, each segment of bankline has been classified based on the product of the bank height and the width of the heavy cobble material found along the shoreline. Each segment of shoreline was recorded in GPS UTM coordinates where the erosion rate changes based on this criteria of height and cobble as the soils, fetch, wind direction and boat traffic are assumed to be relatively constant over time. The GPS coordinates were plotted on maps indicate the starting point of each erosion class with the length of each class measured from the GPS starting point and extending toward the spillway.

The "Shoreline Inventory" provides the locations, lengths and erosion class of each shoreline segment. Protected areas of shoreline in the developed areas of Lake Bloomington's shoreline are also inventoried using a different classification system.

Note: GPS points were identified with a handheld GPS unit and some points appear to be located away from the shoreline a significant distance due to inaccuracy of the unit. Revisiting these sites could provide better GPS location, but has not been deemed necessary as the general locations of erosion classes are identifiable.

Lake Bloomington Shoreline Erosion Summary

Erosion Rating	Erosion Class	Total length of Unprotected Bank	Percent of Total Bank
<10=	Class 1	27,962 feet*	50.30%
11-49=	Class 2	10,790 feet	19.40%
50-99=	Class 3	3,256 feet	5.90%
100-149=	Class 4	4,356 feet	7.80%
150-199=	Class 5	2,670 feet	4.80%
>200=	Class 6	6,546 feet	11.30%
total		**55,580 feet***	**100%**

*This includes 18,480 feet of protected shoreline, generally near residential areas.

Residential Shoreline Inventory

Approximately 3.5 miles or 37% of the Lake Bloomington shoreline are now residential and almost all the residential sites have a seawall of some type installed. These seawalls are largely sheet piling, with some timber walls, concrete walls and a few rock bins fashioned with chain link fencing.

Each segment of seawall has been inventoried and located using UTM coordinates with a handheld GPS unit. As each segment was located a visual rating was assigned along with a measurement of the sheet piling to check for variation from vertical and has been classified as "Good", "Fair", "Poor" or "Critical". There are no objective standards for these ratings but they are an assessment of the overall condition of the seawall based on the observed condition of material and vertical integrity. A "Good" means that there were no observed concerns with the seawall and "Critical" means that the condition was judged to be near failure. A "Fair" rating was assigned where there were observed deficiencies in the wall that indicate some maintenance is needed. A "Poor" rating was assigned where there were numerous or serious problems developing, but the seawall was not yet in danger of failure.

This study provides only an inventory of observed conditions for informational purposes only, no recommendations are given for treatment or repairs to seawalls observed to be in need of maintenance. Installation and maintenance of seawalls has traditionally been the option of the tenant.

Approximately 48% (8,870 ft.) of the protected shoreline at Lake Bloomington was rated as Good in the 2005 Survey. 26% (4,805 ft.) of the shoreline protection was rated as fair, followed by 14% (2,587 ft.) of protection in poor condition and 11% (2,033 ft.) in critical condition.

Streambank Erosion Study

Stream Technical Resource Evaluation and Management Services (STREAMS) was contracted in the fall of 2005 to conduct an inventory and evaluation of the stream network feeding Lake Bloomington. The study has been designed to:

1. Quantify the sediment contributions generated from within the stream system.
2. Evaluate the stability of identified stream segments.
3. Locate and prioritize critical areas of sediment generation.
4. Provide alternative solutions to reduce the sediment contributions.
5. Develop preliminary design and cost estimate data to support the recommendations.

Procedure for Assessment

Money Creek Inventory Map --Lake Bloomington

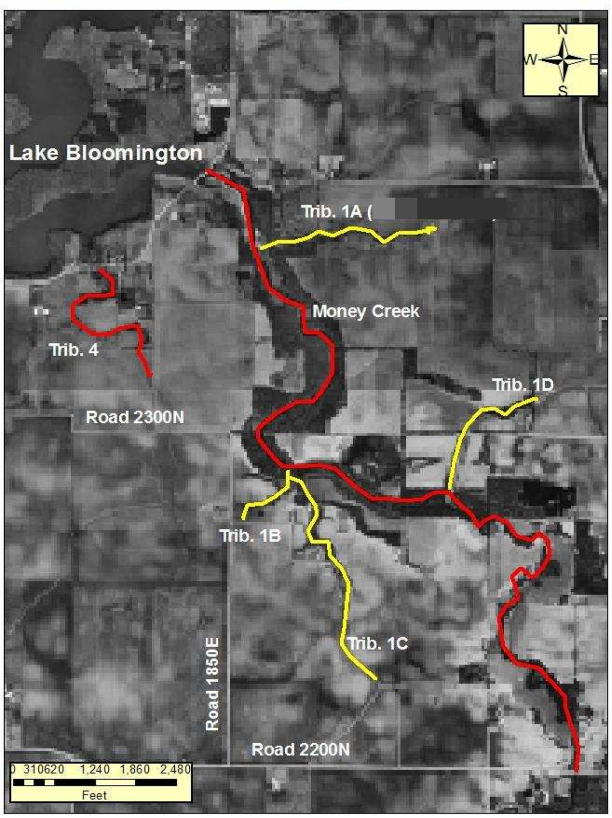


Illustration 1: Inventories Streams Money Creek 1

In October 2005, a reconnaissance survey determined that the upper reaches of the stream system appear to be maintained drainage ditches and waterways with very low sediment contributions. The lower portions of the stream system however begin immediately above Lake Bloomington as natural channels and progress through various levels of “improvements” at intermittent locations before reaching the more actively managed drainage ditches and waterways. The study has been designed to complete a 100% inventory on the lower portions of the major channels beginning at the lake and extending upstream to the start of the “managed” drainage system in each channel. The length of channel inventoried is primarily on 15 miles of Money Creek above Lake Bloomington. The smaller channels and tributaries inventoried include Big Slough and eight additional unnamed tributaries (Illustrations 2-6)

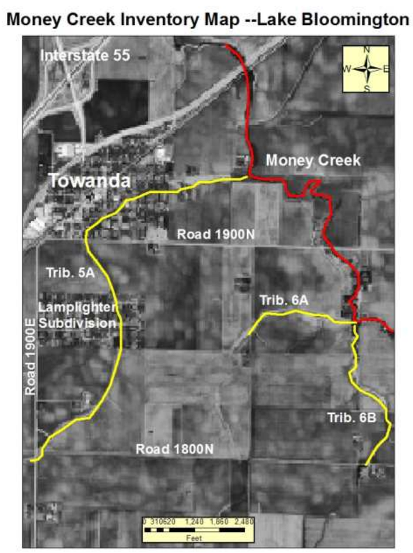


Illustration 2:Inventoried Streams Money Creek 2

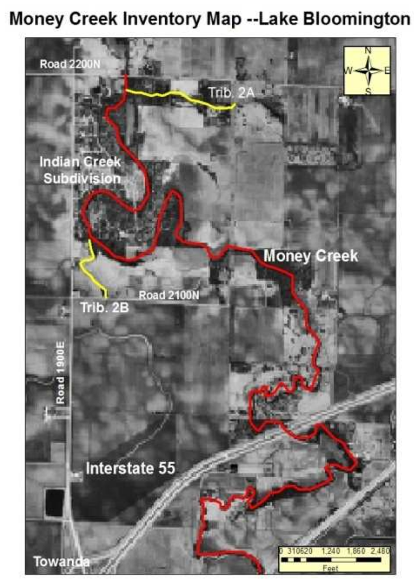


Illustration 3:Inventoried Streams Money Creek 2

Money Creek Inventory Map --Lake Bloomington

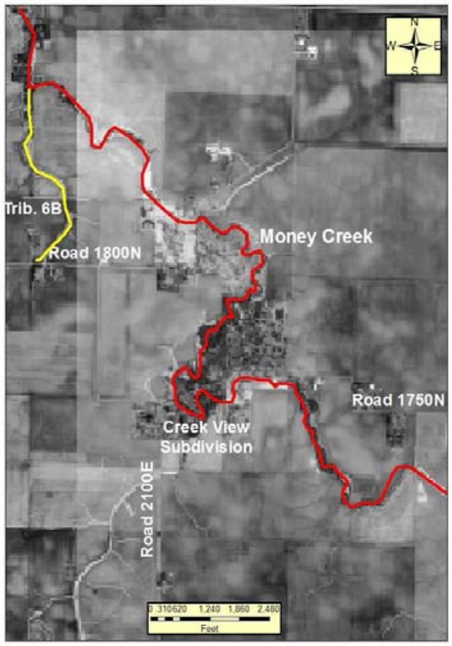


Illustration 4: Inventoried Streams Money Creek 4

Money Creek Inventory Map --Lake Bloomington

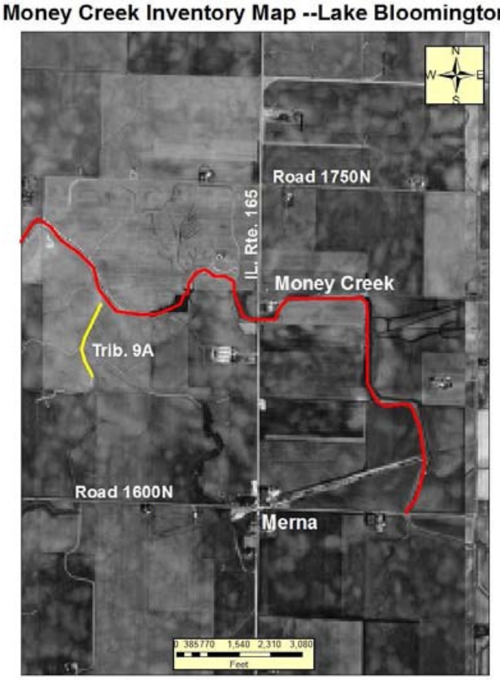
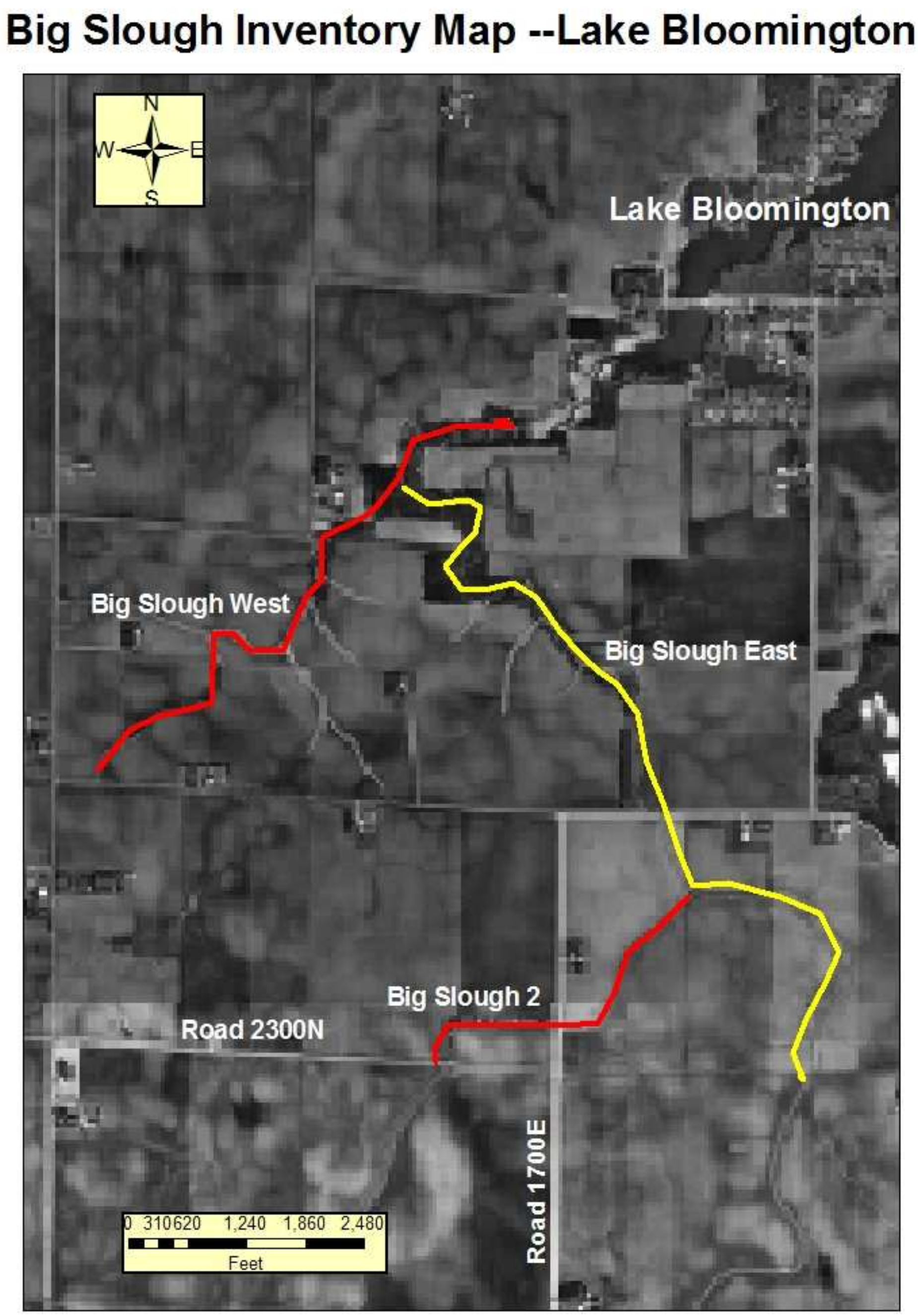


Illustration 5: Inventoried Streams Money Creek 5

Illustration 3: Inventoried Streams Big Slough



The method used to inventory the channels is an expanded adaptation of the Rapid Assessment, Point Method of Erosion and Sediment Inventory Procedures for Illinois, April 2001, Natural Resources Conservation Service. The NRCS procedure is intended to use 160 acre sample plots to estimate erosion from all sources and then expand the results to a larger watershed. In this study only the "streambank" erosion section of the RAPM method was used to estimate sediment contributions. However, rather than use the 160 acre sample plots to estimate soil loss, a 100% inventory has been completed on the major streams as identified earlier. (RAP-M 2007)

A total of approx. 28 miles of channel were physically walked and streambank erosion calculated by estimating the length, height and lateral recession rate of each eroding streambank that met or exceeded the "moderate" level. Lateral recession rates were assigned based on field observations using the guidelines given in the NRCS procedure. Areas determined to have only "slight" streambank erosion were not individually inventoried however the lengths and erosion rates include estimates of contributions from these areas of "slight" erosion.

Erosion Category Description

Estimated Loss (ft/yr)	**Category**	**Description**
0.03	Slight	Some bare banks but active erosion not readily apparent. No vegetative overhang. No exposed tree roots. Bank height minimal.
0.13	Moderate	Bank predominantly bare with some vegetative overhang. Some exposed tree roots. No slumping evident.
0.40	Severe	Bank is bare with very noticeable vegetative overhang. Many tree roots exposed and some fallen trees. Slumping or rotational slips present. Some changes in cultural features, such as missing fence posts and realignment of roads.
1.5	Very Severe	Bank is bare and vertical or nearly vertical. Soil material has accumulated at base of slope or in water. Many fallen trees and/or extensive vegetative overhang. Cultural features exposed or removed or extensively altered. Numerous slumps or rotational slips present. Generally silty or sandy bank material, NOT glacial till or exposed shale bedrock.

Bankfull discharges in Lake Bloomington watershed fall near the typical 1.5 year return interval for rural streams, which means that the height to the top of the bank of the channel is typical for a rural stream. There is little down cutting of the streambed, but lateral movement of the channel may still occur.

- Over 83 percent of the sediment contributed from streambank erosion is generated from Money Creek. The streambank erosion inventory found the total sediment yield to Lake Bloomington from Money Creek alone to be approx. 1050 tons of sediment delivered annually.
- Stream channels inventoried are delivering to Lake Bloomington from 2 tons to 78 tons of sediment per mile of stream channel. The sediment generated from streambank erosion varies widely from the lowest at 1.7 tons per sq. mi.(Trib. 6A) to the highest at 77.8 tons per sq. mi. (Trib. 1B). While Money Creek is producing the most overall sediment since it is the major channel above Lake Bloomington through which approx. 80 percent of total flow can be attributed.
- Unlike Six Mile Creek above Evergreen Lake, Money Creek above Lake Bloomington does not show significant signs of downcutting. Therefore the primary source of streambank erosion comes from lateral bank migration alone. Of the 11 cross sections taken on Money Creek all were found to be in either CEM (Channel Evolution Model) stage 2 or 6, meaning there is no active degradation and/or widening within Money Creek.
- The extent and the magnitude of the CEM Stage 2 and 6 stream segments indicate there are no “system-wide” instability problems in Money Creek.
- Sediment delivery to Lake Bloomington from streambank erosion is significantly less that that found on Evergreen Lake. The total sediment delivered annually from streambank erosion in the Lake Bloomington watershed is estimated at 21 tons per square mile of drainage area while Evergreen Lake was estimated to be delivering 53 tons per square mile.

RAP-M Watershed Study

An erosion/sedimentation inventory was conducted for all land uses in the Lake Bloomington watershed in McLean County. The watershed totals approximately 43,100 acres or about 67.3 square miles. Sediment Delivery Rates (SDR) for each type of erosion occurring within the watershed were also calculated. The main goal was to estimate total sediment load to the lake from the main branch of Money Creek and the major tributaries. This study in its entirety can be found in Appendix III.

SUMMARY OF EROSION AND SEDIMENTATION IN LAKE BLOOMINGTON WATER SHED

In Lake Bloomington watershed, an estimated 106,800 tons of erosion occurs on an annual basis from the six major types of soil erosion: sheet, rill, ephemeral, shoreline, gully, and streambank. If this number is divided by the number of acres in the watershed, a rate of about 2.4 tons per acre per year is obtained, when ALL sources of erosion are considered. Approximately 29,900 tons of suspended and bedload sediment is actually "delivered" to the lake on a yearly basis. This estimated amount of sediment delivered is based on watershed-derived erosion and doesn't represent a measured amount at the outlet end. This gives an overall rate of 0.69 tons per acre per year or 445 tons of sediment per square mile of watershed when the entire watershed is considered. At 30 pounds per cubic foot, this calculates to be 45.7 acre-feet of sediment deposition on an annual basis or at 40 pounds per cubic foot, it calculates to be 34.3 acre-feet of deposition per year.

Roughly 68% of the suspended sediment comes from sheet and rill erosion on all cropland slopes. This land makes up the majority of the watershed with B slopes, 2-5% slope, dominating the crop fields. Approximately 5% is coming from ephemeral erosion (channel) which seems a little low for this type of watershed. Gullies or concentrated flow areas are only contributing about 2% of the total suspended sediment. About 5% comes from streambank erosion (channel). Surprisingly, shore line erosion contributes nearly 14 % of the suspended sediment total. The A/B slope cropland areas appear to be contributing significant sediment but there is still much discussion on SDR rates for slopes less than 5%. It is believed presently that SDR base rates of 0.10 to 0.15 may be more appropriate. These lower rates would reduce sediment totals from the A/B slopes.

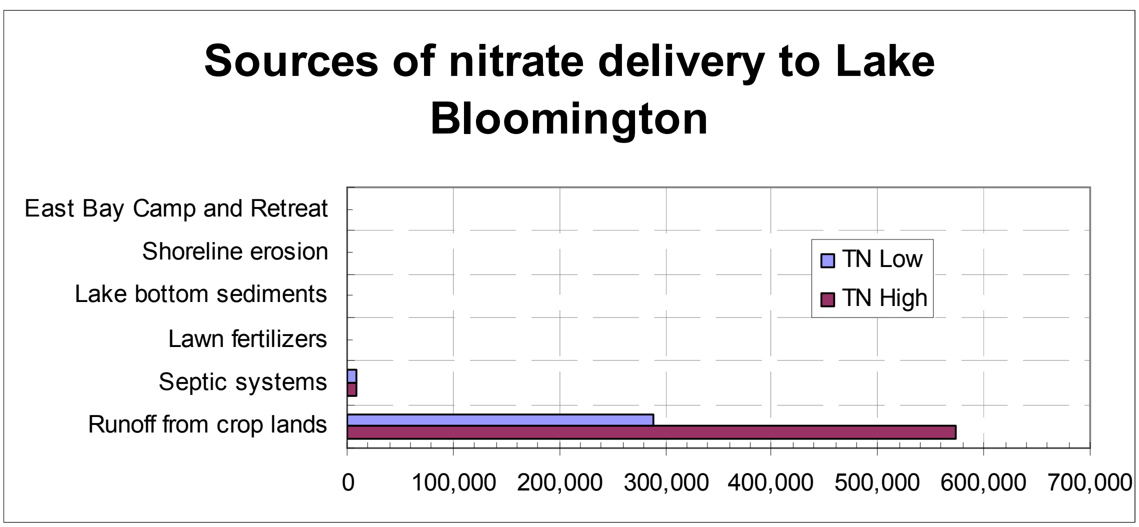
Bedload material is commonly sand and gravel and is very seldom measured as an output at the point of delivery, because of the cost and extensive sampling equipment that is necessary to complete this job. USGS gage stations do not routinely sample or measure this material. General estimates can be made, based on suspended sediment quantities. In Illinois, estimates of 5 to 30 percent of this total can be used. In this case, roughly 3,900 tons were added to the total suspended load delivered of 26,000 tons to arrive at the total delivered sediment amount of 29,900 tons. In most cases, bedload type, composition, and grain size coming from the streambanks and shore lines is used extensively in channel design and channel geomorphology studies. The gullies, streambanks, and shore line sources contribute the majority of the bedload to the system.

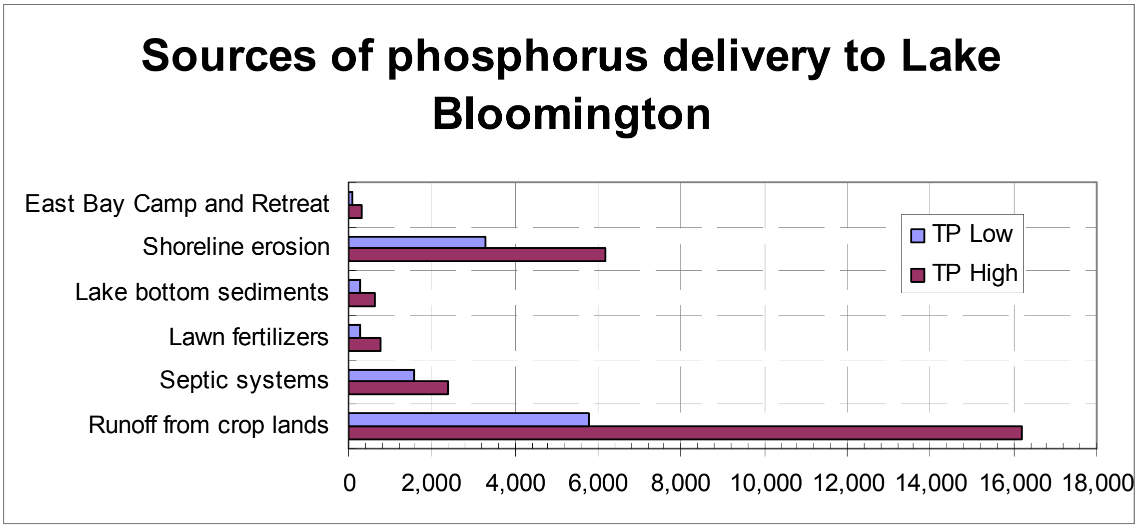
IN-LAKE SEDIMENT STUDY

An in-lake sediment survey was completed in summer and fall of 2005 by Hanson Engineers Inc. The purpose of these surveys is multiple, but one major objective is to determine amount of sedimentation that has taken place in the lake since the dam was closed. The accompanying objective is to then determine how much storage volume remains in the lake and if long-range changes in a lake management plan are needed. They concluded that between the years of 1929 and 1999 approximately 2,436 acre-feet of sediment has accumulated in the lake or about 34.8 acre-feet per year for the entire 70 years lifespan. (See complete report: “Bloomington Lake Sedimentation Survey” by Hanson Engineers Inc., January 5, 2000)

If we compare the sediment that has accumulated in the lake to that which is estimated by this inventory, we can validate both methods and increase the degree of reliability of these projects. Bulk density of the sediment was not directly determined in their survey. If we assume 30 pounds per cubic foot, the total from our inventory would be 45.7 acre-feet on an average annual basis. If we assume 40 pounds per cubic foot, our acre-feet of annual sediment accumulation would be about 34.3. It appears from this that both the “watershed estimate” and the “sink estimate” were very similar. This gives us a certain degree of reliability in the processes that were applied within this watershed.

Erosion and Sediment Totals for Lake Bloomington			
Location	Erosion (tons)	SDR	Sediment Delivered (Tons)
Cropland A/B	93,100	0.18	16,760
Cropland C/C+	1,810	0.55	1,000
Grasslands, CRP, Etc (All Slopes)	3,100	0.25	755
Woodland (All Slopes)	860	0.60	520
Ephemeral	2,000	0.6	1,300
Gully-Lakeside	280	0.85	240
Gully- Money Creek	285	0.70	200
Streambank	1,260	1.0	1,260
Shoreline	3,756	1.0	3,760
Total	**106,800**		**26,000**
		Suspended sediment	26,000
		Estimated Bedload (15%)	3,900
		Sediment transported to lake	**29,900**





Water Uses

The primary use of Lake Bloomington (572 acres) is as a reservoir for the City of Bloomington. The city has 3 pumps rated at 27.5 million gallons of water per day total pumping capacity at the lake. Pumpage levels vary widely between the years and during the year, depending on the weather and the water quality in both Lake Bloomington and Evergreen Lake, and (if other factors permit) maintenance of a water level to support recreational uses during the summer. At the current average pumping level of 11.4 million gallons per day, the lake contains enough water for approximately 250 days. In addition, leaseholders are permitted to draw water directly from the lake for irrigation purposes only.

Much of Lake Bloomington's shoreline is occupied by residences and camps (three) on land leased from the City of Bloomington. In addition, several city parks are scattered around the shoreline. Accordingly, Lake Bloomington experiences considerable recreational use including motor boating, waterskiing and tubing, sailing, canoeing and kayaking, swimming and fishing. In the winter there is some ice skating, ice fishing and snowmobiling when ice thickness permits, but given central Illinois climate this usually occurs only for brief periods, if at all, each winter. While residents and their guests are the primary recreational users, a marina provides mooring for boats (primarily pontoon boats) owned and operated by non-residents and many non-residents use the boat launch to put in boats on a daily basis.

Boats must be registered with the lake ranger and have complete access to the lake. Motorized boats are limited to a 40 horsepower motor and jet skis are prohibited. Outside of the large basins, the lake is posted as a "no wake zone" where motors are to be operated at idle speed. Since these zones are generally narrower and shallower than the basins, this regulation has the dual purpose of helping to minimize shoreline erosion due to wake action and enhancing boating safety. Most of the shoreline area in the "no wake zones" is natural as opposed to the primarily steel seawalls that front the great majority of the residential sites.

Lake Bloomington is inhabited by fish species including large- and smallmouth bass, hybrid striped bass, walleye, bluegill, crappie and catfish. While some species occur naturally, the Illinois Department of Natural Resources also direct a long-term fishery management plan for the lake. Since 1984, the lake has been stocked with almost 127,000 largemouth bass fingerlings, 575,000 walleye fingerlings and 25,000 hybrid striped bass fingerlings.

Conservation

Conservation Practices

The City of Bloomington, Pheasants Forever, and the McLean County Soil & Water Conservation District (SWCD) have provided funds for filter strips along waterways in both the Evergreen Lake and Lake Bloomington watersheds. Filter strips, an important Best Management Practice (BMP) and easily installed, had 213 acres formerly enrolled in the Lake Bloomington watershed in the Conservation Reserve Program (CRP) by the beginning of 2007.

The city of Bloomington has installed interlocking concrete blocks and seawall protection as erosion control measures around Lake Bloomington and plans to implement extensive shoreline stabilization measures, possibly to include riprap and plantings as described in the implementation section of this plan.

Nature Preserves in the Watershed

The Lake Bloomington/Money Creek Watershed contains some lands that are protected as nature preserves in which the emphasis is maintaining and restoring native vegetation. Such lands are very important in reducing the inputs of TMDL pollutants because they keep portions of the watershed in a native vegetational condition. Two entities have worked to establish such nature preserves: ParkLands Foundation and the Indian Creek Homeowners Association. In total, these preserves protect approximately 122 acres.

1. Parklands Foundation

ParkLands Foundation (www.parklandsfoundation.org) is a nonprofit, public membership land trust dedicated to acquiring, preserving and restoring natural areas in central Illinois since 1967. ParkLands manages over 1,500 acres of its own land, including the Merwin Nature Preserve along the Mackinaw River in McLean County, and also assists with the management of The Nature Conservancy's (TNC) Chinquapin Bluffs Natural Area in Woodford County.

Within the Lake Bloomington/Money Creek watershed, ParkLands Foundation owns 102 acres of lands that it manages and restores into native vegetational communities such as tallgrass prairie and deciduous woodlands.

The Moon Tract Nature Preserve consists of 42 acres of a former farm field/pasture that is located one-half mile east of Carver Corner on the north side of the road, on the central-west side of Lake Bloomington. The goal for this preserve is to restore the site to high-quality tallgrass prairie and oak savanna woodland through planting a diverse assemblage of native wildflowers, grasses, and trees using local ecotypes whenever possible.

The Breen Woods I Preserve consists of 38 acres of woodlands southwest of the East Bay Camp on the east side of Lake Bloomington. The site consists of a scotch pine plantation and an old field that is regenerating in trees. The goal for this preserve is to restore the site to native deciduous woodlands.

The Breen Woods II Preserve consists of two separate tracts totaling 22 acres and are located on the south side of the P.J. Kellar Blacktop approximately one mile east of the Lake Bloomington dam. The tracts are interspersed with land owned by East Bay Camp. The tracts consist of a high quality deciduous woodland dominated by oaks. Management is needed to prevent the invasion of maple trees that are displacing the higher quality oaks and hickory which provide more value to wildlife.

2. Indian Creek Homeowners Association

The Indian Creek Homeowners Association (www.frontiernet.net/~indiancreek) is a group of nearly 100 homeowners making up the Indian Creek subdivision. The wooded, rural subdivision is located within the Lake Bloomington/Money Creek watershed two miles due north of Towanda on the east side of County Road 1900. It straddles Money Creek about 3 miles southeast of where it enters Lake Bloomington.

The Indian Creek subdivision consists of approximately 160 acres of former farmland, pasture, and deciduous woodland, including approximately 60 acres of common ground that was deemed unsuitable for home construction. Approximately 20 acres of this common ground are being maintained by the residents as a private nature area with hiking trails along Money Creek. Management efforts carried out entirely by resident volunteers include trail maintenance, exotic species control, placement of bird houses, tree identification tags, and removal of "weed" trees in areas where older oak and hickory trees are still found. Future goals include continued restoration of the woodland, and establishment of a prairie in an open area that had previously been used as a soccer practice field.

Problem Statements

The primary problems in the Lake Bloomington watershed are that the level of phosphorus and nitrates are too high, and that sedimentation of the lake is occurring. The Lake Bloomington Steering and TAC Committees have addressed the sources of phosphorus, sedimentation, and nitrates and prioritized them.

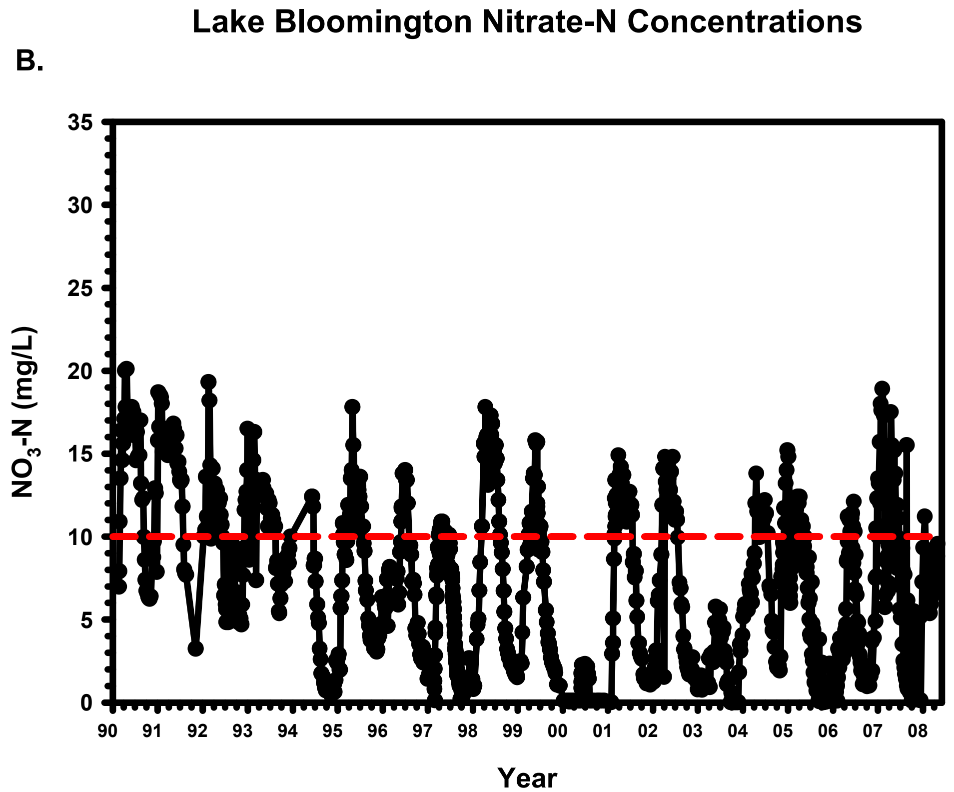
A. Inconsistent water supply to the City of Bloomington:

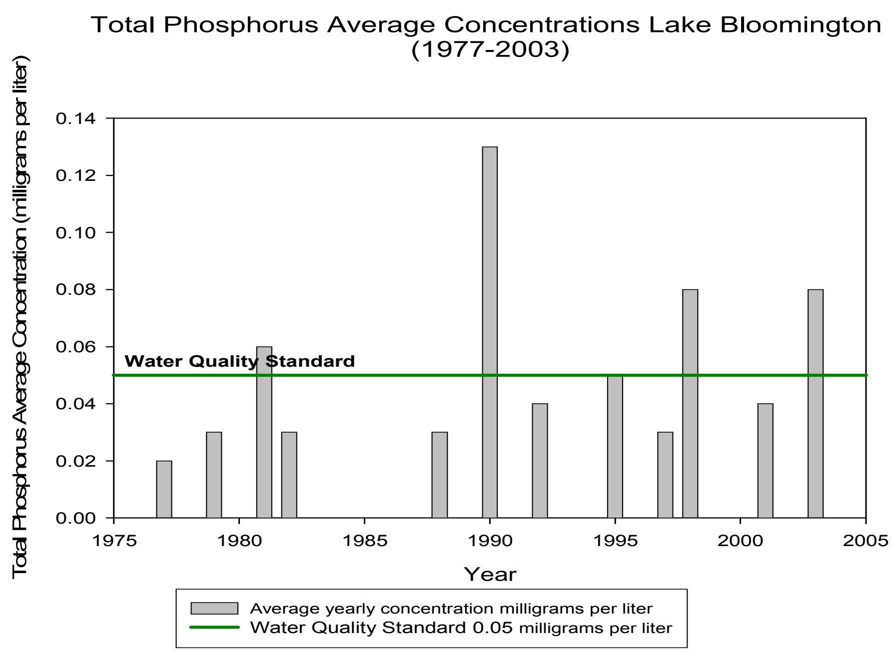
The IEPA TMDL phosphorus limit level (0.05 mg/l) may or may not be attainable, and as standards might be revised over the course of the implementation, the planning committee met to address problems in the watershed based on current regulations. The IEPA TMDL nitrate level is 10ppm. Sedimentation and/or turbidity does not have a mandated level. The plan will strive to implement strategies to work toward the current limits. Lack of data in many areas acts as a significant detriment to planning, therefore data gathering is part of future planning.

TOTAL PHOSPHORUS AVERAGE CONCENTRATIONS & RANGES LAKE BLOOMINGTON 1977-2003

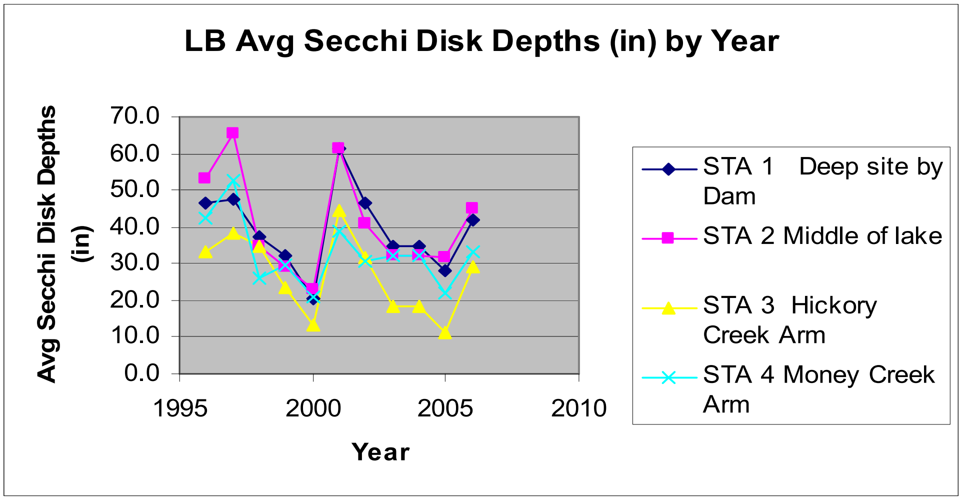
Year	Average Yearly Concentration (milligrams per liter)	Minimum – Maximum Concentration (milligrams per liter)
1977	0.02	0.01 – 0.04
1979	0.03	0.01 – 0.05
1981	0.06	0.01 – 0.2
1982	0.03	0.01 – 0.04
1988	0.03	0.02 – 0.22
1990	0.13	0.02 – 0.51
1992	0.04	0.02 – 0.09
1995	0.05	0.02 – 0.11
1997	0.03	0.01– 0.06
1998	0.08	0.03 – 0.23
2001	0.04	0 – 0.44
2003	0.08	0.06 – 0.09

Data from Illinois EPA & City of Bloomington


Lake Bloomington Nitrate-N Concentrations
B.
35
30
25
20
15
10
5
0
NO_3-N (mg/L)
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08
Year


Total Phosphorus Average Concentrations Lake Bloomington
(1977-2003)
Total Phosphorus Average Concentration (milligrams per liter)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Water Quality Standard
1975 1980 1985 1990 1995 2000 2005
Year
Average yearly concentration milligrams per liter
Water Quality Standard 0.05 milligrams per liter

Water Clarity



Water clarity is a commonly used indicator of lake water quality. Water clarity (also called transparency) is measured in lakes using a Secchi disk. The 20 centimeter diameter disk is lowered into the lake and recording the depth at which it disappears from view.

Regular measurements of Secchi disk transparency are taken over the course of the summer and over many years. The general trend in transparency over the years gives an indication of the trend in water quality for the lake. Increasing water clarity indicates decreases in suspended sediment or decreases in nutrients entering the lake. Decreasing clarity indicates increases in suspended sediment or nutrients.

Continued shoreline, streambank, and sheet and rill erosion

An estimated 106,800 tons of erosion occurs on an annual basis from the six major types of soil erosion within the Lake Bloomington watershed. Approximately 29,900 tons of suspended and bedload sediment is actually “delivered” to the lake on a yearly basis.

The 2005 study by Wayne Kinney predicts approximately 3800 tons of sediment are generated annually in Lake Bloomington shoreline erosion.

C. Volume loss of Lake Bloomington by sedimentation

After the 1958 raising of the dam, at normal level Lake Bloomington held 7352 acre/feet of water. Since then 33% of the volume of the lake has been lost due to sedimentation. Overalll, 2436 acre/feet of sediment has entered the lake, with the average of 0.4% loss every year.

D. Nutrient impacts (high nitrates, phosphorus, algae, sedimentation)

1. Upland erosion from cropland is carrying phosphorus into the feeder streams.

- Studies done by local fertilizer dealers show an average phosphorus level in area agricultural land is 37-42 pounds per acre.
- Nitrogen from agricultural land is released by fertilizers applied to enhance crop production as well as being released naturally from the soil profile.

2. Agricultural animals in the watershed are contributing phosphorus through their waste.

- There are 414 head of livestock in the watershed in 25 operations.
  - 286 cattle (6 operations)
  - 6 swine (2 operations)
  - 42 Horses (18 operations)
  - 80 sheep (8 operations)
  -

E. Effects of Urban Development

1. Older or malfunctioning septic systems discharge nutrients to the watershed.

- 1,600-2400 lbs. of phosphorous per year.
- 8,400-9,500 lbs of ammonia per year

2. Urban lawn fertilization adds nutrients to the watershed.

- 7/10th of 1% (302 acres) of the watershed is urban lawn area
- total input data is unavailable, but data from studies indicates that urban fertilization has less than 1% of the nutrient load to the watershed.

3. Urban construction runoff contributes excessive sediment and phosphorus to surrounding surface waters.

- Construction sites that are mass graded are often left free from protection the entire year
- Rich black soils high in organic matter are stripped off and expose highly susceptible subsoils to erosive elements
- Compacted soils on construction sites reduce infiltration of rainwater and contribute more runoff and therefore erosion of highly susceptible soils

- Rain events occurring on one acre of a construction site can contribute 20 times the sediment or more that of typical agricultural lands of same soil type and grade if not protected using proper soil erosion and sediment control BMP.
- The lbs of Phosphorus contributed by these lands is only obtainable through specific analysis of soils data and compliance with recommended NPDES Phase II requirements for construction site BMPs.
- Nitrogen, associated with eroded soil, from construction sites results in a negligible amount of nitrate input to surrounding surface waters.

4.Increase in impervious surfaces

- Reduced groundwater recharge
- Increased flashiness in receiving water bodies
- Increased flow/velocity in receiving streams
- Increased temperature of receiving waters
- Increased delivery of urban pollutants

F. **Impacts to recreational resources and wildlife habitat**

1. Fish survey data indicates that Money Creek has an IBI index of 24-30, which indicates it is Class Low.
2. Game fish management objectives have not been met in Lake Bloomington due to contributions of sedimentation and water level fluctuations.
3. Studies have shown that carp in the lake increase turbidity and resuspend phosphorus in the lake.

G. Gaps in scientific information

1. Biota information.-Further information on the plants and animals of the watershed is needed to:

- track changes in water quality;
- improve knowledge of the presence and health of any Illinois listed species (Illinois Species in Greatest Need of Conservation, Illinois Threatened, Illinois Endangered);
- counteract current ecological degradation.

Regular stream surveys of mussels, fishes, and EPTs (invertebrate groups ephemeroptera, plecoptera, and trichoptera) will provide an important biotic index of water quality. Surveys searching for and restoring listed species will ensure that our natural biotic legacy is known, appreciated and protected. Ecological health surveys and ecological restoration of public land and cooperating private land will help reverse the negative impacts of invasive species (e.g., garlic mustard) and overabundant native species (e.g., maple trees, white-tailed deer) that are degrading the native ecosystems, thereby reducing their ability to retard soil erosion, ameliorate high and low flows, and act as a natural water purification agent.

2. Tile information in watershed in incomplete and not collected in an organized coordinated manner.

3. Discharge from onsite waste systems from homes adjacent to Lake Bloomington in not measured in any manner at this time.

4. Gauging stations from Money and Hickory creeks needs to be restored to collect current data.

5. Inadequacies in the modeling.

Future modeling efforts can benefit from improvements in data collection. Some specific data needs that need to be considered are:

- local measurements of precipitation and pan evaporation;
- updated measurements of flow from Money, Hickory and other creeks;
- direct measurements of septic flow along the lake boundary.

In addition, there should be coordination with The Nature Conservancy's modeling efforts in the Mackinaw River valley that includes this watershed. Finally, expert watershed modelers should be consulted to establish the key parameters that need measurement for future modeling efforts and assist in choosing the most appropriate models for this type of watershed.

H. Adequacy of knowledge, awareness of, and incentives to implement BMP's and other suggested strategies in the watershed

There are numerous challenges for the implementations of best management practices (BMPs) including, for example, funding challenges, staffing challenges and educational challenges. While the Lake Bloomington watershed employs some BMPs, including nutrient management programs and filter strips coordinated through the NRCS, more BMPs could be employed.

While not measurable, anecdotal evidence suggests significant outreach programs (i.e. education and marketing) result in higher utilization of both existing and proposed programs.

Ongoing education and information to stakeholders of the Lake Bloomington watershed, including but not limited to funding agencies, is imperative to implement BMPs in the watershed.

Goals/Objectives

There are three water quality issues in Lake Bloomington: nitrate/nitrite levels, phosphorus levels, and overall increased sedimentation. The goals are geared toward reductions in these areas. Goals are divided as to the three geographical areas in the watershed: the Riparian Area, which included the lake itself and all shoreline, stream banks, and feeder streams; The Urban Area, which includes all urban high density developments in the watershed; and the Agricultural Area which is the majority of the watershed land use.

Riparian Area Goals:

1. Streambank erosion

   Stabilizing the streambank erosion on the lake feeder streams will reduce the amount of phosphorus entering the lake by 20%.

1. Lakeshore erosion

   Controlling lake shore erosion will reduce the amount of phosphorus entering the lake by 60%.

2. Internal Loading

   The destratifier is presently responsible for reducing the amount of phosphorus held in the deep zone of the lake. We would expect that the effectiveness of the destratifier would continue. The destratifier increases the oxygenated zone from 16 ft to 30 ft. The oxygenated zone has approximately 65% less phosphorus than the anoxic zone.

Urban Area Goals:

1. Development of Construction Erosion and Sediment controls

   Develop and enforce ordinances to control the discharge of sediment with associated phosphorus so that water leaving these sites does not contribute to the turbidity of receiving water bodies.

2. Urban Lawn fertilizer reduction

   An increase in educational programs will raise awareness in the community to low or non-chemical lawn care.

3. Urban Septic system replacement and inspection

   a. Replacement of inadequate septic systems as detected by inspections would reduce the amount of phosphorus and nitrates entering the watershed.

b. Attaching the Lake Bloomington developed area to the Bloomington-Normal Water Reclamation District would reduce phosphorus and nitrates from onsite waste delivery entering the watershed by 100%.

Agricultural Area Goals:

1. Voluntary nutrient management plan. (Specific goals articulated in the table following.)
2. Upland Cropland erosion

   a. Reduce delivery of sediment from upland erosion caused by sheet and rill, and ephemeral erosion by 21% in the next 10 years to the lake if there is 100% compliance. The expected compliance is 25%. This will be accomplished through implementation of agricultural Best Management Practices such as no-till/strip-till, grassed waterways, terraces and water and sediment control basins, filter strips and field borders. Along Agricultural corridors, reduce streambank and shoreline erosion and the accompanying sediment delivery to the lake by 16%, at 100% compliance, through streambank and shoreline stabilization projects. The expected compliance is 20%. These practices will include rock riffles, stream barbs and longitudinal peak stone toe protection.
3. Livestock Management Plan

   a. The estimated phosphorus load created by livestock operations in the Lake Bloomington Watershed is 1503 pounds. Based on NRCS staff surveys of the 6 livestock producers in the watershed, it is believed that 17% of the producers would voluntarily engage in BMPs. However engaging this 17% would eliminate approximately 25% or 376 pounds of phosphorus.
4. Tile Drainage

   Based on a study by David Kovacic, it is estimated if 5% of the estimated tile area that is drained in the watershed is converted to wetlands (382 acres), then a 46% reduction of nitrogen load would be obtained, which would be 95% of the required reduction of TMDL requirements. NRCS/SWCD staff has estimated that 20 acres of constructed wetland would be realistic.

Lake Bloomington Nitrate/Nitrite Reduction Goals				
Source	**Estimated Nitrate Load (tons)**	**Estimated participation Per unit**	**Estimated reduction of existing load**	**Projected reduction percentage**
Field Tile runoff	72,000	63%	50% (36,000 lbs)	5.8%
Post-construction urban runoff	Data not available			
Septic tank Ammonia	8,700	See Problem Statement		
Agricultural Livestock	41,338	25%	25% (1034.5 lbs)	1.6%
Feeder stream delivery	591,319	8%	5% (29,825 lbs)	4.8%
Estimated Total	718,544	-------------	66,859.5 lbs	9.3%
Mandated Reduction Total	**----------------**	**-------------**	**622,441 lb/yr**	**48%**

Lake Bloomington Sedimentation Reduction Goals				
Source	**Estimated Sediment Load (tons)**	**Estimated participation per unit**	**Estimated reduction of existing load**	**Projected reduction tons**
Streambank erosion	1,260	5,434/217,360 feet	20%	315
Sheet and rill erosion	20,355	18,000/36,000 acres	5%	1,018
Shoreline erosion	3,688	6,546/55,580 feet	20%	738
Post-construction urban runoff	Data not available			
Urban construction runoff	Data not available			
Estimated Reduction Total		**N/A**		**2,071**

Lake Bloomington Phosphorus Reduction Goals				
Source	**Estimated Phosphorus load (lbs)**	**Estimated participation per unit**	**Estimated reduction of existing load**	**Percentage Of Mandated Reduction**
Streambank erosion	1,237	5,434/217,360 feet	20% (247 lbs)	3.65
Sheet and rill erosion	19,988	18,000/36,000 acres	5% (999 lbs)	14.5
Shoreline erosion	3,087	6,546/55,580 feet	60% (1852 lbs)	27.4
Field tile runoff	198	15,360/36,000 acres	50% (94 lbs)	1.5
Agricultural livestock	1,503	1 /4 operations	50% (376 lbs)	5.6
Post-construction urban runoff	Data not available			
Urban Lawn fertilizer	Data not available			< 1%
Internal lake loading	351	100%/ 1 unit	65% (228 lbs.)	3.3%
Urban septic system	2,000	See Problem Statement		
Estimated ReductionTotal	-------------------	--------------------	3,568 lbs	52.7%
Mandated Reduction Total (89% of existing load)			**6,762 lb/yr**	

An error was found in the original Lake Bloomington TMDL report estimating the needed reductions to meet Illinois Environmental Protection Agency water quality standards. This errata sheet is dated February 19, 2008; therefore, the errors were found after we had completed our calculations for this watershed plan. TetraTech recalculated the needed reductions based on their revised load estimates, with the new reductions for the watershed now estimated to be 34% for nitrate-N and 66% for total P. We report these new reductions for information only, and have not adjusted our estimates.

Best Management Practices

Riparian Practices

Lakeshore Erosion Control

Solutions considered to halt the bank recession in this area are evaluated in this report based on seven factors.

1. The solution should first provide long term control of the receding bankline, in excess of 50 years.
2. The solution must be socially acceptable and aesthetically pleasing given the public use of these areas.
3. The solution must allow for installation during normal lake operation levels.
4. Contamination of the lake during construction should be at the lowest possible level.
5. If possible it should enhance the aquatic habitat and improve fisheries in the lake.
6. Cost per foot of bank is always a consideration.
7. The solution should maintain as much lake volume as possible.
8. All erosion class 2 to class 6 shoreline (27,618 feet) would benefit from stabilization.

Using these criteria, the tradition method of bank control using "sheet piling" in the residential portion of the lake has not been considered due to cost and aesthetics, assuming a more natural looking bankline is the desired result. Six alternative approaches were considered in the 2005 Study.

All six traditional alternatives would utilize a stone bankline below the waterline and extending approximately 2 ft. above the waterline. While there is not a comprehensive study of the wave action on Lake Bloomington, this height proved to be sufficient in the study conducted on Evergreen Lake and given the similar size and orientation the Evergreen Lake results will be applied to Lake Bloomington. This stone bankline will provide the bank stability to prevent additional bank recession and will be constructed of RR-5 stone which will provide a rocky substrate as an additional element useful for aquatic habitat enhancement.

Initial consideration was given to utilizing the existing cobble eroded from the bankline to supplement the stone requirements of the bank protection measures. However, discussions with fisheries biologist, Mike Garthaus from IDNR suggest that the cobble found in the lake provides a useful habitat element that should be left in place for fish enhancement. The shallow water depths found along the eroding banks are also a negative factor for fisheries; however the alternatives proposed will all reduce the extent of the shallow water area near the bank by placing fill material within the lake near the present shoreline.

Armor Stone Breakwaters with Transitional Wetland Alternative

An additional alternative to the traditional shoreline protection alternative selected in the 2005 report is Armor Stone Breakwaters with Transitional Wetlands. Normally recommended for reservoir shorelines where the fore slope has been reduced to at least 8h:1v. Toe protection for the breakwater is generally provided by a riprap apron placed on the fore slope.

A proposed armor stone breakwater is sometimes considered to be a hazard to boating, however, when located near the original shoreline, the structure is in shallow water where an operating power boat would be in imminent danger of running aground regardless of the existence of a breakwater. A shallow water location also minimizes the required quantity of stone.

An armor stone breakwater stops shoreline retreat, provides an area of quiet water near shore where a beneficial wetland habitat can flourish and space is available for the back slope to attain it's angle of repose.

At Kinkaid Lake in Jackson County, IL , just a few years after it began, armor stone breakwater shoreline work already is reaping clear benefits. New wetlands created between the rock berms and the shore are filled with vegetation and aquatic life where bare dirt once existed. Biologists report 121 species, including two state-threatened species, have moved in to colonize those new wetlands. Even the view from above looks different as water clarity improves. (IDNR, Outdoor Highlights, 7/07)

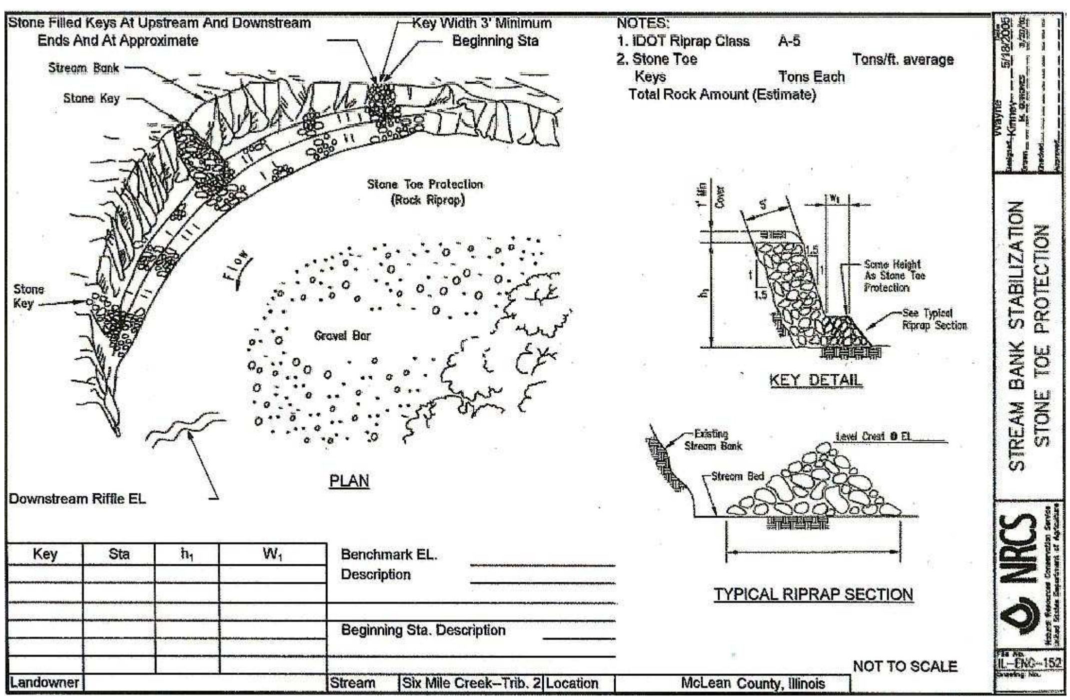
Traditional, shoreline stabilization has been accomplished by using heavy construction equipment to build temporary roads, reshape the eroded shoreline, and place riprap. This method can be destructive to valuable woodland habitat and steep slopes, particularly in areas where there are no existing roads. Armor Stone Breakwaters can also be developed using construction methods that utilize boats to deliver materials to remote shorelines without damaging the woodland habitat or steep slopes. The Armor Stone Breakwaters do not require reshaping the shoreline and facilitate a diverse shoreline habitat.

Streambank Erosion Control

The Bankfull Width over Bankfull Depth ratios (W/D) range between 8 and 15 with the exception of Cross Section #2 on Big Slough East with W/D ratio of 5.5. Therefore the recommendation is to avoid use of Stream Barbs and/or Bendway Weirs to redirect flow from eroding banks. Use of these techniques is only applicable to wider W/D ratio channels with significant bar material that can be easily moved by the channel flow. The most effective and economical treatment in the majority of locations within the Lake Bloomington watershed will be to “harden the toe” of the eroding banks to prevent continued undercutting and slumping of banks. In isolated cases there will be a need for limited use of “grade control” to halt active downcutting. Stone Toe protection (STP) and Rock Riffles (RR) are the preferred methods recommended.

Stone Toe Protection (STP): (Fig. Below) Each eroding bank can be protected with non-erodible materials. Typically meandering bends similar to those in the Lake Bloomington watershed can be stabilized by placing the hard armor only on the toe of the bank. The most common method is to use quarry stone properly sized to resist movement and placed on the lower one third of the bank in a windrow fashion. This technique is called Stone Toe Protection (STP) and is widely accepted and successful.

There are a few obstacles to overcome in this watershed to make use of STP successful. First, some of the bends in the channel are “unstable” having a radius of curvature less than 1.5 times the channel width. Research has shown that bends with a radius of less than about 1.8 times the bankfull width are unstable and tend to “cutoff”. In order to use STP successfully under these conditions the channel would need to be “realigned” in order to produce a radius of curvature that falls within the range of “stable” geometric planforms. Installing STP without making these channel adjustments would be to risk failure of the STP and encourage channel cutoffs leaving the STP application in an “abandoned” reach of channel. Second, the total amount of eroding bank will require many sections of the stream to have STP on one side or the other, resulting in extensive use of STP and a very costly application.

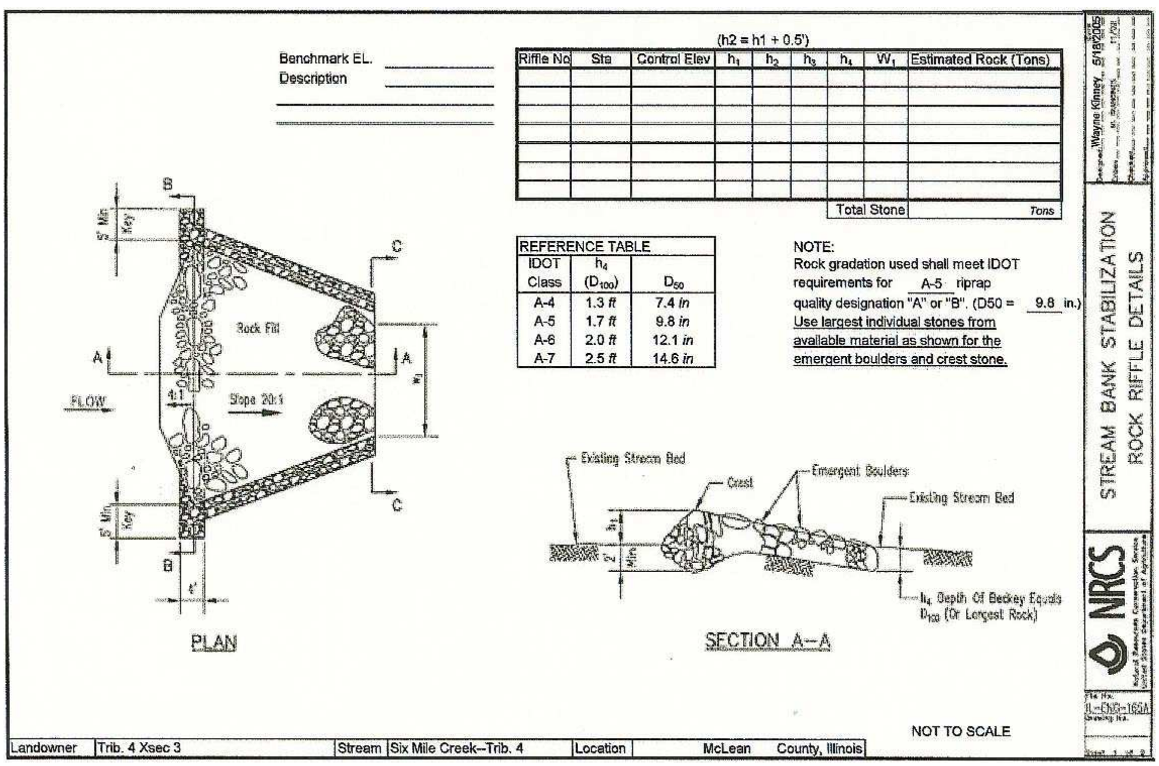


NRCS Standard Drawing of Stone Toe Protection

Rock Riffle Grade Control (RR): (Fig. below) Use of loose rock grade control structures at the “natural” riffle locations in a stream will create or enhance the “riffle-pool” flow sequence found in natural channels. In stable systems this alternating “riffle-pool” sequence dissipates the energy in the stream and allows the streambanks to remain stable with little or no appreciable lateral movement. By installing RR in an incised channel, the riffles will raise the water surface elevation resulting in lower effective bank heights, which increases the bank stability by reducing the tractive force on the banks.

Research has found that stable streams have a riffle every 5 to 7 bankfull widths and that at this natural spacing the stream is still able to transport the sediment generated in the watershed. This is crucial because failure to be able to transport sediment would result in the channel filling with sediment and losing its capacity. Such stable streams therefore have a well developed floodplain at the one to two year return interval discharge rate. Thus the flows larger than this go "out-of-bank" and dissipate excess energy over a wide floodplain, allowing the banks to remain stable and intact.

In Lake Bloomington watershed only Big Slough East has significant need for rock riffles. Rock riffles are also recommended for some tributaries to Money Creek, however these are smaller drainage areas and the total impact to Lake Bloomington is small from these sites.



NRCS Standard Drawing for Rock Riffle Grade Control

Destratification

The destratifier is presently responsible for reducing the amount of phosphorus held in the deep zone of the lake. We would expect that the effectiveness of the destratifier would continue. The destratifier increases the oxygenated zone from 16 ft to 30 ft. in the entire volume of the lake. The oxygenated zone has approximately 70% less phosphorus than the anoxic zone.

Agricultural Practices

There are several Agricultural BMP's that are proven to reduce sedimentation, nitrate and phosphorous levels. They include nutrient management developed by TSPs (Technical Service Providers) based on proven recommendations that manage the amount, form, timing and placement of nutrients, so nutrients are available for plants and least likely to leave the farm. Other non-structural practices that can benefit the streams, Lake Bloomington and overall environment are no-till and strip-till on cropland areas and filter strips, and riparian buffers along field borders, windbreaks and streams. Structural practices that can reduce nutrient inputs include wetlands, grassed waterways, grade stabilization structures and drainage water management.

Wetlands are a Best Management Practice (BMP) that is proven to reduce nitrate and phosphorous levels entering lakes and streams. Wetlands in the watershed near agricultural lands that intercept tile drainage are a practical and simple tool to improve water quality. The logistics of siting wetlands that have tile outletting into them are challenging in many locations, while the cost of wetland installation can be considerable. Landowners are not always receptive to implementing wetlands because of production mindsets to drain cropland and the long term loss of production cropland to ag wetlands.

Urban practices

Lawn Chemical Application

There are several straightforward solutions to the use of lawn chemicals in the Lake Bloomington Watershed, particularly in the "shoreland buffer," the very sensitive strip of land along the edge of the lake.

- Rely exclusively on fertilizers with no phosphorous and shift from the use of synthetic, fast-release N fertilizers to slow-release synthetics or organic fertilizers.

- Shift from pure cool-season turfgrass lawns to mixed clover-turfgrass lawns by overseeding existing lawns with white clover.

- Reduce the amount of lawn through conversion of sections of grass to rain gardens and/or beds of wildflower and native grasses. Rain gardens or swales and berms would be particularly helpful along sloping shoreline and between downspouts and the lake.

- Rain barrels would also help to reduce downspout flows into the lake.

- Go entirely native, especially along the shoreline buffer along the water's edge. All turfgrass could be replaced with sedges, native grasses, wildflowers, groundcovers, shrubs and trees.

Implementation strategies/Alternatives

Riparian Implementation:

Lakeshore developed areas implementation strategies

Use North Park, Riley Starkey, and Association Park, as the equivalent of agricultural experiment stations to develop examples of best practices landscaping for the environmentally sensitive shores of Lake Bloomington. North Park could play a particularly important role in experiments with a shoreland buffer of prairie grasses and wildflowers. We also need to determine whether there is a temperate region equivalent to vetiver grass that could be planted directly into the bare soil in the steep banks. Vetiver grass has an extensive record of success in land reclamation projects in the tropics and semi-tropics, so a temperate climate equivalent would greatly assist in efforts to stabilize steep banks with exposed soil.

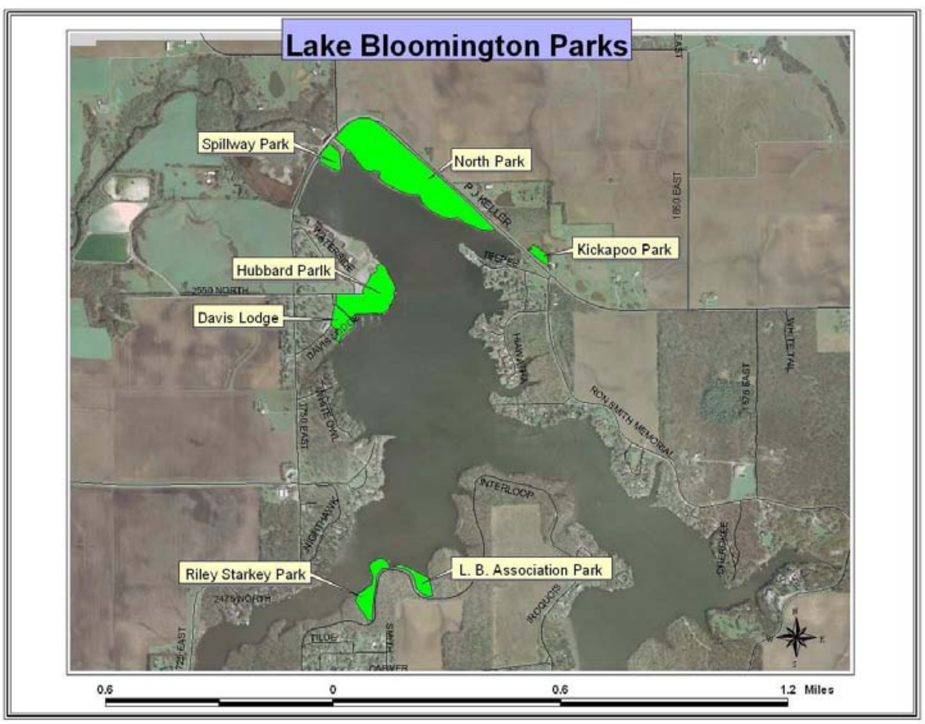
The sun burnt areas of both North Park and Association Park can be used for experimentation with white clover/turf grass mixes. The parks can also allow demonstrations of berm and swale rain gardens, and trials of dry, shade tolerant groundcovers (e.g, Adonis amurensis, Epimedium, Pulmonaria saccharata, Symphytum grandiflorum, Vinca). Better yet, go native and use various prairie/woodland sedges (Carex jamesii, Carex, pensylvanica, Carex bicknellii) and woodland groundcovers and plants, such as sharp-lobed hepatica (Hepatica acutiloba), prairie smoke (Geum trifolium), flowering spurge (Euphorbia corellata), etc., to cover the presently barren, erosion-prone soil.

After experiencing successes in the pocket parks and the Keller Park, turn the grounds of the Davis Lodge into a model of ecologically sound lakeside landscaping. Among other things, this would likely involve:

- Creating swales and berms along sloping areas of lake frontage with water-loving prairie grasses, sedges, and wildflowers planted in the swales. Swales and berms function in a manner analogous to buffer strips between agricultural land and streams (Hemenway 2000:83-86). These "rain gardens" would capture any run off and filter the water before it reaches the lake (Bannerman and Considine 2003).
- Reducing the total area given over to lawn grass by converting sections of the grounds to native grasses, sedges, and wild flowers. This will demonstrate the

beauty and elegance of native plants that require *neither fertilizer nor water* (Nowakowski 2004; Burell 1999: 56-57, 112-113, 117, 120,156-157,190-191198-199,282-291) while increasing habitat for bees, butterflies, and birds (Lewis 1999; Stein 1993; Tufts 1993).

- Transform the remaining grass lawn to a mixed clover/grass turf . As noted, a clover/grass turf needs neither fertilizer nor pesticides, requires considerably less or no watering, and will remain refreshingly green when exclusively grass turfs turn dusty tan.
- Encourage lakeside residents to convert their lawns to mixed clover/turfgrass and to adopt some variant of the Yard Smart and/or Wildlife Habitat programs sponsored by the Ecology Action Center of Normal (ECA-1, 2007). Successful experiments at the pocket parks can serve a strong research and educational tool and a model of best management practices, as can some of the residences along the lake. Organize a yard tour of the transformed parks, grounds of the Davis Lodge, and willing lakeside residents who have already adopted ecologically sound, non-polluting practices in their landscapes.



Once successful examples of mixed clover/turf grass lawns exist, create incentives for the use of best management practices and disincentives for the use of fertilizers with phosphorus, fast-release sources of N (e.g., urea, ammonium nitrate, ammonium sulfate, liquid fish solutions), and pesticides (e.g., “weed ‘n feed” mixes); encourage non-pesticide fertilizers with slow-release sources of N (coated ureas, urea formaldehyde); and create incentives for the use of slow-release organic fertilizers (corn gluten pellets, soy, etc.).

Lakeshore Erosion Implementation

Due to the steep, high banks, and extreme fluctuations in water levels, biotechnical means of shoreline stabilization were excluded from consideration. The recommended alternative selected in the 2005 Study, based upon cost and impact upon near shore woodland cover is Stone Toe Protection (STP) which when applied along the eroding sections to an elevation of 721.5 will provide the stability needed to protect the base of the bank and prevent any additional recession of the bank line. The STP will be placed at a distance from the eroding bank to allow for the bank to be sloped on a 2:l slope and vegetated by balancing the cuts and fills so that no material need be transported to or from the site.

This alternative has the advantage of allowing initial placement of the STP from the top bank before any earthwork begins, drastically reducing the opportunity for lake contamination. The use of STP also places the maximum volume of stone at the base of the slope where erosion is most severe. This provides additional safety and effectiveness to the use of STP as there is sufficient stone to launch into any area that may erode on the lake side of the STP and still maintain protection of the shoreline. The disadvantage of this treatment is the volume of stone needed and the loss of vegetation along the top bank.

The advantages STP treatment are:

1. No net loss of lake volume as excavated volume will exceed the volume displaced by STP.
2. Reduced volume of material needed from top bank to create 2: 1 slope.
3. Preservation of more existing vegetation on top bank.
4. Lake levels normally reach the level needed each year to make this alternative feasible.
5. Construction during low lake levels will keep contamination to an absolute minimum as no equipment will need to be in the water for construction.
6. STP can be placed prior to excavating lake bed to prevent silt from re-entering the lake.

7. The 12 to 15 foot bench along the lake side of the STP for equipment operation will prevent any excessive undercutting of the STP by equipment operators or future erosion.

8. Cost is reduced while preserving the advantage of durability and long term protection with little need for maintenance.

9. Cut slope above 721.5 can be easily vegetated and maintained to provide a natural looking bank that will be aesthetically pleasing.

10. Excavation in the lake will reduce the area of shallow water which will enhance the aquatic habitat within the lake. Additional enhancements within the deepened water areas can be added during construction as recommended by the IDNR Fisheries Biologist.

The recommended treatment is applicable to all sites and discussions with Richard Twait, Superintendent of Water Purification, indicate that fluctuations in Lake Bloomington during normal operations will provide ample opportunity for installation during low water periods. The choice of Stone Toe Protection is recommended primarily because of the additional durability and safety of the design.

Streambank Erosion Implementation

Brief Narrative of Stream Segments and Treatment Recommendations:

While there is significant streambank erosion in the Lake Bloomington Watershed, it is not as critical nor as severe as that found in the Evergreen Lake Watershed. Money Creek and its tributaries lack evidence of widespread systematic stream instability. This makes the treatment recommendations easier to apply in that there are no negative consequences to making channel improvements in a random piecemeal manner as landowner interest may dictate. With no system wide problems, there is little danger of stream channel protection projects being negatively impacted by changes in the channel characteristics and adjustments taking place upstream or downstream. There are a few exceptions to this generalization where Rock Riffle grade controls have been recommended, however these sites are relatively small and the degradation is not severe, nor rapid, therefore many opportunities are available to work in and around these sites with willing landowners.

Money Creek and Big Slough East should be the top priority for streambank stabilization with the highest priority given to sites rated with “severe” erosion closest to Lake Bloomington. Second priority would be “severe” erosion sites on tributaries to Money Creek.

Money Creek

No active degradation is occurring and no significant degradation has occurred in the past. Lateral bank protection is only needed in eroding areas where the channel is meandering by undercutting existing banks causing bank slumping. Use of Stone Toe Protection (STP) at 0.75 ton per foot is the general recommendation.

Tributary 1A

No inventory or recommendations will be made because information concerning this tributary is not available.

Tributary 1B (1,320 feet)

This is a very small tributary draining only about 30 acres. There is however a significant degradation problem about midway on this tributary. Use of Rock Riffle grade control or a traditional waterway or dry dam would be alternatives to treat this segment.

Tributary 1C (2,640 feet)

The lower end of this tributary has been extensively channelized in the past with one segment having been moved several hundred feet by cutting through a high ridge. Since the drainage area is only 1.4 sq. miles the existing channel in this reach has developed a small floodplain to reach CEM stage 6, i.e. it is stable with an active floodplain. Treatment recommendations are limited to STP where lateral migration is occurring.

Tributary 1D (2,376 feet)

The lower end of the tributary has been extensively modified and there is some evidence of downcutting from just above the confluence with Money Creek to a point approx. 0.25 mile upstream. This lower segment would be benefited by Rock Riffle Grade control structures. Above this point only STP is needed for lateral migration control.

Tributary 2A (2,640 feet)

This tributary is degrading on the lower 0.25 mile above Money Creek and would benefit from Rock Riffle Grade control structures. The area is heavily wooded and access will be difficult. Above the actively degrading section only STP for lateral migration is recommended.

Tributary 2B (1,848 feet)

This tributary has minor degradation problems on the lower 0.35 mile above Money Creek. A combination of Rock Riffle Grade controls and STP is recommended for this segment. Above this reach the channel is well maintained and no treatment is recommended.

Tributary 4 (2,904 feet)

This is a direct tributary to Lake Bloomington with a very steep gradient on the lower 0.5 mile above the lake. A combination of Rock Riffle Grade control structures and STP is recommended for this segment. Above this reach the channel is well maintained and no treatment is recommended.

Tributary 5A (15,576 feet)

This tributary drains the village of Towanda. Between Towanda and Lamplighter Subdivision the channel has been “cleaned and shaped” in the fall or winter of 2005/2006. This segment is completely devoid of vegetation and was a potential source of large sediment loads during the spring of 2006. A significant headcut exists at the north edge of the subdivision, however it appears that there are plans to continue with the “cleaning and shaping” through the subdivision.

The recent channel work makes it difficult to determine the future needs of this segment; however use of STP will certainly be required to halt lateral migration through the entire inventoried reach. It is possible that Rock Riffle grade controls will also be needed after construction and an inspection of the area has been completed.

Tributary 6A (4,480 feet)

This is a well maintained “open drainage” ditch with sloped and maintained sideslopes. No treatment recommendations are made for this segment.

Tributary 6B (4,224 feet)

This tributary has no degradation problems, therefore the recommendation is to use STP only where lateral migration is occurring.

Tributary 9A (10,296 feet)

This is a well maintained “open drainage” ditch with a heavy stand of Reed Canarygrass. No treatment recommendations are made for this segment.

Big Slough East (25,080 feet)

This is a direct tributary to Lake Bloomington and there is some degradation occurring midway between Road 2350 North and the Lake. The recommendation is to use Rock Riffle Grade control and STP below Road 2350 North and STP only above Road 2350 North for lateral migration.

Big Slough 2 (7,392 feet)

This is a tributary to Big Slough East with no degradation. STP for lateral migration only is the recommended treatment.

Big Slough West (6,705 feet)

This is also a tributary to Big Slough East with no degradation. STP for lateral migration only is the recommended treatment.

Destratification

On June 20, 1996, destratifier units were placed on the bottom of Lakes Bloomington and Evergreen. The units are designed to maintain adequate dissolved oxygen levels in the lakes. The City of Bloomington installed the units as part of its overall lake management program. The Illinois State Water Survey Office of Water Quality Management recommended the system.

Dissolved oxygen is an extremely important substance in lakes. Dissolved oxygen (D.O.) is essential for fish and other organisms to survive. Lake water can gain D.O. through the release of oxygen by algae and other submerged aquatic plants. Another major source of oxygen transfer occurs at the lake surface, where oxygen from the atmosphere can diffuse into the water.

Oxygen can be consumed in lakes by fish and other organisms, by algae and other plants when no light is present, by the decomposition of organic matter, and by oxygen demanding substances. Decaying matter in the sediments of the lake bottom can also cause D.O. levels to drop. In the lower levels of a lake, oxygen can be consumed faster than it can be replaced, and the D.O. levels can drop to zero.

Without D.O. in the bottom levels of lakes, compounds can be released by the lake sediments which can cause excessive growth of algae and can cause taste and odor problems in drinking water. The part of a lake where no dissolved oxygen is present is called the *anoxic zone*.

Like most constructed lakes in the Midwest, Lake Bloomington and Evergreen Lake develop anoxic zones during the summer months. As the summer progresses, the anoxic zone grows and undesirable compounds, including phosphorus, concentrate. The anoxic zone is prevented from mixing with the oxygen rich upper layer of the lakes by a sharp difference in temperature (called a thermocline) between the two layers. The depth at which the thermocline forms is a function of lake morphometry and energy transfer from the wind during the spring months, and can range from 12 to 18 feet from the surface of the lake.

In the fall, the upper layers of the lakes cool down. When the temperature of the upper layer approaches the temperature of the bottom layer, the entire lake can mix (*lake overturn*). The oxygen demanding compounds, the taste and odor causing compounds, and the nutrients that can cause excessive algae are then released into the entire lake. This is the time when taste and odor problems most often occur in drinking water.

The destratifiers provide uniform temperature and oxygen only to the depths at which they are deployed. The destratifier at Lake Bloomington is deployed near the water intake structure at a depth of 35 feet. As a result, depths greater than 35 feet will form an anoxic zone.

In order to arrive at a crude, conservative, estimate of internal loading of phosphorus due to anoxic conditions in the lake and to estimate the load reduction due to destratification, several assumptions were made. The first assumption was that all of the phosphorus loading from anoxic release of P occurs during fall overturn. The second assumption was that elevated P concentrations only occur in an anoxic zone extending two feet above the sediment surface, with chemical precipitation and other processes keeping P concentrations near background levels in zones extending greater than 2 feet above the sediment. The Total P concentration for the bottom 2 foot layer for October 2005 was estimated as the average of the concentrations for the 1 foot and 3 feet samples (0.32 mg/l P).

Using the depth volume relationship developed in the Hanson Engineering sedimentation survey of 1999, 0-2ft above the sediment surface water volumes were calculated for each 2 foot depth increment and multiplied by the 0.32 mg/l total P concentration. The pounds of phosphorus contained in each 2 foot “ring” were then summed for a total of the pounds of phosphorus in the anoxic zone of the lake.

For the October, 2005, samples, the calculated mass of phosphorus was 147 pounds. If the destratifier was not operating and the anoxic zone started at 15 feet, the calculations would result in a mass of 797 pounds of phosphorus. The P load reduction from the destratifier would then be approximately 650 pounds per year. The destratifier operated on an intermittent basis over the last few years. The unit operated continuously during the summer of 2007.

Wetlands

The City of Bloomington has been concerned with high nitrate concentrations (at or near the 10ppm EPA limit) in drinking water for several decades. The following excerpts from Rutherford and Twait (2005) (Title: Source Water Protection and Watershed Management:

A Rural and Water Supply Perspective,Governor's Conference on the Management of the Illinois River System, October 2005) describe some of actions the City and cooperating agencies have taken to deal with the nitrate problem.

Examination of the existing historical nitrate data shows that the highest nitrate levels came after the drought of 1988-89. High levels of nitrates, due to lack of uptake by crops, accumulated in the soil and leached out quickly with the first significant rainfall after the drought. Low water levels provided little dilution for the high nitrate runoff entering the reservoirs. Future droughts may result in similar conditions.

City staff had assumed that the nitrate problem was mainly related to agricultural fertilizer. Other possible sources included onsite waste system discharges from villages and homes within the watershed and from residences around Lake Bloomington. Relative contributions of the various possible sources needed to be determined before any possible solutions could be implemented.

In 1992, the City asked the SWCD and Watershed Conservationist to locate sites and get permission to sample from different locations in the Money Creek watershed. Money Creek is the main tributary to Lake Bloomington. Samples were collected and analyzed for nitrate by City staff from drainage tile outlets, surface runoff, and from various points along Money Creek.

The sampling program expanded in 1993, when the City entered into an agreement with Dr. Ken Smiciklas, of the College of Agriculture at Illinois State University, to study the nitrate problem. Students from ISU collected samples from the expanded sites and delivered them to the water treatment plant for analysis. The results from the sampling program showed that the most of the nitrates entering Lake

Bloomington came from field tiles (1). The City resumed sampling responsibilities in 2003.

In order to keep the watershed stakeholders involved and informed about the study, Professor Aaron Moore, also of the College of Agricultural at Illinois State University, sent out a semi-annual newsletter. He also performed annual surveys of the farm operators throughout the watershed for their current and intended farming practices, including details of their proposed nitrogen fertilizer application. Group meetings with people from the watershed have also been held to answer their questions and give them information about the study.

The next phase of the study with Illinois State University was to determine if different agricultural practices could help reduce the amount of nitrates leaving the fields through the drainage tiles. In early spring, 1997, the City, with the McLean County Soil and Water Conservation District and ISU, installed individual tile drainage networks for six 5-acre test plots in a farm field next to City property at the upper end of Lake Bloomington. The test plots were developed on a privately owned field that was previously only minimally tiled.

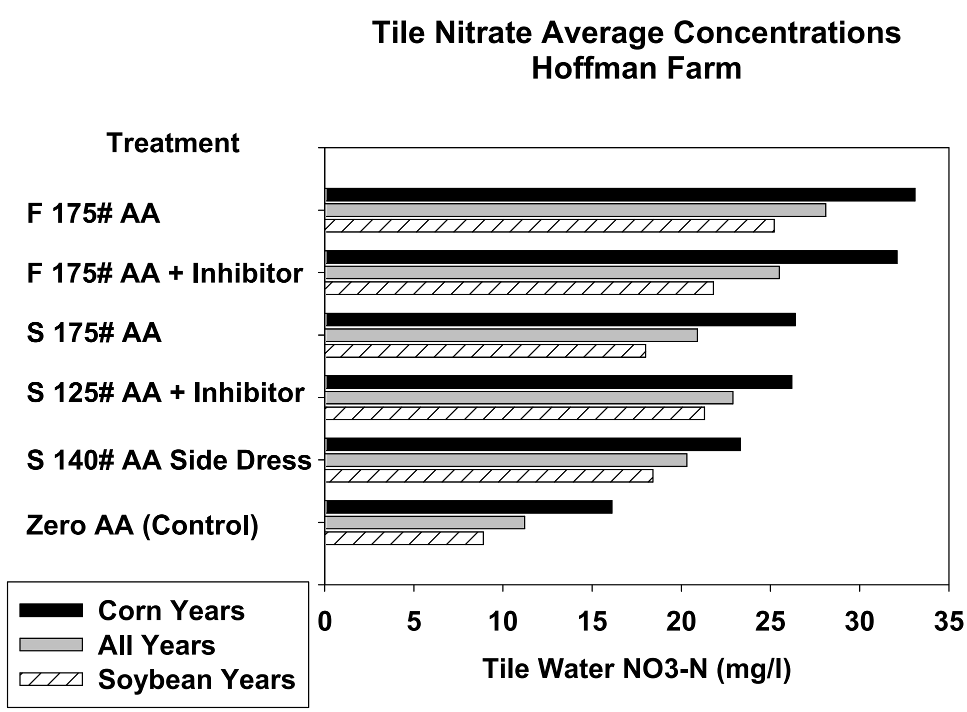
The City entered into an agreement with the landowner and farm operator to continue the traditional corn/soybean planting rotation, but to vary the timing, rate, and use of nitrification inhibitors on individual test plots. The treatments are fall application of anhydrous ammonia, one field with and one field without inhibitor, spring applications with and without inhibitor, one post emergent side dress application, and a control plot which receives no anhydrous ammonia. Nitrate concentrations in tile drainage from each of the fields are measured, along with harvest quantities and plant conditions.

So far, the clearest results are that fields with fall application of anhydrous ammonia experience higher nitrate losses than from spring applications. Yields are drastically reduced from the field where no ammonia is applied. Since weather patterns exert such a large effect upon crop growth and harvest, and corn is only planted every other year, the City will continue to work with the landowner and farm operator on the study to get a better idea of the effects of soybean nitrogen fixation and carryover and the effectiveness of inhibitors on productivity and nitrate losses.

A third part of the City's study is to determine if there are natural ways to remove nitrates from the water between the discharge points of field tiles and the intakes for the Water Treatment Plant. In conjunction with the tile study, another study was started with Dr. Dave Kovacic of the Department of Landscape Architecture at the University of

Illinois. Dr. Kovacic is studying the use of created wetlands nitrate removal and removal of other nutrients. Dr. Kovacic has done similar studies in other areas of Illinois and has documented 36% nitrogen removals from wetlands. He has also documented that buffer or filter strips alongside tributary streams can remove another 9% of the nitrogen from the water that flows across the strips (Kovacic, D.A., and Mark B. David, Lowell E. Gentry, and Karen M. Starks. 1999. Use of Constructed Wetlands to Reduce Nitrogen and Phosphorus Export From Agricultural Tile Drainage. Journal of Environmental Quality.).

City property along Money Creek adjoins the private land containing the experimental tile fields. Experimental wetlands were constructed on the City property in the fall of 1997. Tile flow from the experimental fields and surface flow from the fields is directed into the wetlands through control structures equipped with flow monitors and samplers. By knowing the exact quantity and quality of the water coming into the wetlands as well as the quantity and quality of water leaving the wetlands, the effectiveness of the wetland in removing nitrates can be determined. By knowing the exact area of agricultural land draining into the experimental wetlands, size requirements



for additional wetlands can be determined. The wetlands were shown to be effective in removing both nitrogen and phosphorus from the inflowing drainage.

Kovacic, et.al.,2006 (Kovacic, David A., Richard M. Twait, Michael P. Wallace, and Juliane M. Bowling. 2006. Use of created wetlands to improve water quality in the Midwest – Lake Bloomington case study. Ecological Engineering 28 (2006) 258-270) determined that nitrogen was reduced by 36% in the wetlands, and 53% of the total phosphorus entering the wetlands was retained. Much of the P retention was due to sedimentation within the wetlands.

Agricultural Implementation:

Agricultural implementation plans are those most commonly practiced in proactive Midwestern agricultural areas. These practices are:

- Nutrient Management - Managing the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments
- No-till and strip till - Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil disturbing activities to only those necessary to place nutrients, condition residue and plant crops.
- Riparian Forest Buffer - An area of predominantly trees and/or shrubs located adjacent to and upgradient from watercourses or water bodies
- Contour Buffers - Narrow strips of permanent, herbaceous vegetative cover established across the slope and alternated down the slope with parallel, wider cropped strips
- Field Border - A strip of permanent vegetation established at the edge or around the perimeter of a field.
- Field Windbreaks - Linear plantings of single or multiple rows of trees or shrubs or sets of linear plantings
- Wetlands - The rehabilitation of a degraded wetland or the reestablishment of a wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the original natural condition that existed prior to modification to the extent practicable.
- Developing Incentives – New and innovative practices that may be forthcoming to address current and future conservation needs.
- Grade Stabilization Structure - A structure used to control the grade and head cutting in natural or artificial channels.

- Grassed Waterway - A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation
- Conservation Cover - Establishing and maintaining permanent vegetative cover to protect soil and water resources.
- Prescribed Grazing - The controlled harvest of vegetation with grazing or browsing animals, managed with the intent to achieve a specified objective
- Drainage Water Management - The process of managing the water table elevation and the timing of water discharges from surface and subsurface agricultural drainage systems.

Conservation programs available to producers include the Federal programs such as Conservation Reserve Program (CRP),), Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentive Program (WHIP), and the Wetlands Reserve Program (WRP). Federal and state partnerships such as the Conservation Reserve Enhancement Program (CREP) and state and locally administered programs such as the Stream bank Stabilization and Restoration Program (SSRP) and Conservation Project Practices (CPP)

Urban Implementation:

Monitoring System

Another issue stemming from urban runoff is that there is very little monitoring of this runoff. An increased monitoring system is needed to pinpoint problem areas in the urban areas so further plans can be developed.

The primary purpose of the Urban Monitoring program is to measure contributions in runoff quantity and quality emanating from the urban development sites within the Money Creek watershed. Storm water runoff from urban and urbanizing areas is recognized as a cause of water pollution. Seven locations along Money Creek and its tributaries would monitor the effects of urban and suburban effects on the watershed.

Education and public awareness

This control measure will target homeowners, restaurateurs, industry and the general public. An informed and knowledgeable community is crucial to the success of storm water management. As the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters, a greater compliance with the storm water program will result. The plan has two major initiatives: the formation of partnerships and the use of educational materials.

The Ecology Action Center and other educational resources, such as the SWCD, U of I Extension Office, and McLean County, will provide program information, give residents an opportunity to share resources and participate in activities and events in regard to local environmental issues: greenways, bikeways, natural conservation areas, recycling and water quality issues. Education topics might include the benefits of recycling and opportunities for enhancing greenways. The educational materials will include, but will not be limited to, the following:

Brochures

- Alternative information sources (websites, bumper stickers, posters etc.)
- A library of educational materials
- Summer camp/club programs
- Portable Storm Water Informational Display/Exhibit

The public education program will use a variety of strategies in which to reach a diverse audience. Mass media campaigns will use a mix of media to generate a watershed message to our audience. Our local strategies will use television and radio ads, including multilingual posters.

The school education program will target school age children. The programs will teach students the water cycle, the watershed, the benefits of composting and storm water runoff. In addition, Project WET training classes will be held by Heartland Community College for educators in district 540.

The education effort would target homeowners about proper septic system maintenance, proper disposal of used motor oil, chemicals pesticides and household products. As noted by the IEPA, septic systems are a potential source of non-point source phosphorus loading. A long range solution to failing septic systems is connections to a municipal sanitary sewer system. Installation of a sanitary sewer will reduce existing nutrient sources by replacing failing septic systems and will allow development without further contribution of phosphorus loads to Lake Bloomington. Costs for the installation are generally paid over a period of several years (average of 20 years) instead of forcing homeowners to shoulder the entire cost of installing a new septic system. In addition, costs are sometimes shared between the lake community and the utility responsible for treating the wastewater generated from replacing the septic tanks. The planning process is involved and requires participation from townships, cities, counties, lake associations, and citizens.

Support by the citizenry is crucial to the success of storm water management. The measure will involve all socio-economic groups. The public participation program is a key component of the public education measure. Broader public support in the development and decision making process will minimize potential legal challenges.

Public Participation/Involvement

Public meetings will provide an opportunity to discuss various viewpoints and provide input concerning appropriate storm water management policies and practices.

Community cleanup projects for local streams, riparian corridors, trails, highways, streets, open space and parks will be targeted.

Recycling programs will be enhanced**.** The largest pollutant components in our storm drains and water bodies will be identified. A recycling program will be modified to target the largest pollutant components.

Both Bloomington and Normal have established storm water phone hotlines to aid enforcement authorities in the identification of polluters.

"Adopt a Storm Drain" program, will offer individuals and groups an opportunity to monitor what is entering through our waterways.

Storm water inlet stenciling programs in both Bloomington and Normal have been initiated to help raise community awareness.

A watershed oversight committee comprised of agency officials, residents, and property and business owners will be organized to provide input and address concerns and questions that may arise with new policies, programs and improvements.

Rural communities and rural subdivisions in the watershed will be included in educational programs and implementation planning. Rural communities will be encouraged to adopt sediment, erosion control and stream bank buffer ordinances like those of the nearby urban areas and the county at large.

Illicit Discharge Detection/Elimination

The illicit discharge detection measure will involve both municipal staff and citizens. Each jurisdiction will locate illicit discharge problems areas through public complaints, visual screening and dry weather screening methods. The program will work to detect and eliminate illicit discharges.

The local Geographic Information System (GIS) will be used to map the location of all storm sewer outfalls and all the waters that receive storm water discharges. The GIS will also allow the input of citizen complaints and dry weather screening and monitoring data.

Construction Site Runoff Control

It is recognized that construction sites can deposit a significant amount of silts and sediments in a short period of time. The City of Bloomington has adopted and the Town of Normal will adopt an Erosion and Sediment Control (ESC) Ordinance to reduce construction pollutants in its storm water runoff. (Appendix IV) The ordinance will require that land disturbance of 5,000 square feet or more will be regulated. It requires developers, builders or owners to submit a plan that contains measures to reduce soil erosion and practices to control sediments. Additionally, ESC requires the submittal of construction plans prior to ground being broken. Once a plan is reviewed and approved, staff will endeavor to ensure that the ESC plan is followed. The ordinance then requires the developer, builders or owners to install and maintain those specified measures and practices agreed to in the plan. Sites may be inspected for compliance and if found lacking, an inspector may issue a permit violation, stop work order, fine or other measure to ensure compliance.

McLean County is considering a separate erosion control ordinance apart from the Manual Practice of the Subdivision Ordinance, but does not have one at this time. (Manual Practice Ordinance can be found in Appendix VI)

Post Construction Runoff Control

Both the City of Bloomington and the Town of Normal propose to address the post-construction runoff with structural and non-structural management practices. The controls seek to reduce the amount of impervious cover, by increasing natural land set aside for conservation and to use pervious areas for more effective storm water management. The Town of Normal has looked at a variety of ways to increase green spaces. For example, Normal has new landscaping requirements for parking lots.

Jointly the County, the City and the Town are developing a Stream Buffer Ordinance for developing areas, which includes, but is not limited to, the 100-year flood plain. (Appendix IV)

Structural management practices shall include the use of wet and dry retention basins, which will principally be used in the urban environment. Programs for designers and developers will provide information on proper design and the overall need for retention basins.

Pollution Prevention/Good Housekeeping

- Pollution prevention/good housekeeping measures for municipal operations program goal is to reduce pollutant runoff from municipal operations. The vehicle maintenance program requires that all city-owned vehicles be regularly inspected to eliminate the amount of oil, grease, and fluid leaks.
- Street sweeping has become more frequent in high traffic areas.
- A program for the inspection of storm drains has been developed.
- An Integrated Pest Management program (IPM) will be developed and offered. The program will train municipal employees on current best management practices for pest management. Lawn pesticide application classes will be offered to municipal employees and city residents.

Septic System Improvements

Septic tanks generally remove 20% to 30% of the influent phosphorus (Lombardo, 2006). Crites and Tchnobanoglous (1998) reported average septic tank effluent concentrations of 68 mg/l total Nitrogen (as N) and 16 mg/l total phosphorus (as P). The amount of nutrients delivered to a lake or stream from an onsite system depends greatly on the type and condition of the septic tank effluent dispersal system.

Leach (or seepage) fields disperse the septic tank effluent through the soil column, ultimately reaching the water table or seep into a lake or stream. Phosphorus is removed through absorption to the soil or through the formation of mineral precipitates. Ideally, all of the phosphorus is removed in the seepage field, but many factors influence the system's effectiveness.

The amount of water that can flow through a particular soil type over time is referred to as the soil's hydraulic conductivity. The lower the hydraulic conductivity, the larger the seepage field area is required. Most of the soils surrounding Lake Bloomington have very low hydraulic conductivity, necessitating seepage field sizes that cannot be accommodated within the small lots leased by the City.

Hydraulic conductivity can decrease over time through compaction of the soil by foot and vehicle traffic, through clogging of the pore spaces in the soil by precipitates or from solids carryover from a malfunctioning or overloaded septic tank, and other factors. When the loading rate exceeds the hydraulic conductivity, the soil becomes saturated and the septic tank effluent can flow upwards to the soil surface or flow horizontally along preferential flow paths. The horizontal flow can discharge into a stream or lake if the failing system is close to the waterbody. The Onsite Wastewater Treatment Systems Manual (USEPA, 2002) discusses soil properties and design considerations for seepage systems.

Sand filters remove 10-20% total phosphorus and 18-33% total nitrogen from the septic tank effluent. Health Department regulations require chlorination of sand filter effluents, which helps to remove microbial contamination and can remove some ammonia nitrogen through the process of breakpoint chlorination. The City of Bloomington requires a 50 foot gravel effluent receiving trench prior to discharge. The effect of the trenches on reducing nutrient loading is not known.

Estimating Phosphorus and Nitrogen Loading by Onsite Systems

Several assumptions are necessary in order to estimate the nutrient loads from the onsite waste systems in the Lake Bloomington watershed. First, the systems closest to the lake deliver their entire nutrient load to the lake. Second, 25% of the seepage field systems deliver partially treated septic tank effluent to the lake (Lindsay Knitt, Farnsworth Group, personal communication, 2007). This relatively high percentage was chosen due to the low hydraulic conductivity of the soils, the close proximity of many of the leach fields to the lake, and the observation of nutrient rich effluent at the base of many of the shoreline protection systems during low water periods.

Water usage values and house occupancy was estimated using USEPA system design numbers (70 gallons per day per person equivalent and 3.5 person equivalents per home). Average septic tank effluent concentrations of 68 mg/l total nitrogen and 16 mg/l total phosphorus, along with the water usage figures listed above, were used to estimate the nutrient loading per household prior to treatment by the dispersal systems.

Total nitrogen loading was estimated at 50.6 pounds per year and total phosphorus at 11.9 pounds per year per household before secondary treatment.

The 402 homes closest to the lake, 249 with seepage fields and 153 with sand filters, were included in the loading analysis. The residences with sand filters were estimated to contribute 5,200-6,400 lb/year total N and 1,500-1,700 lb/year total P.

Additional assumptions were made for the loading estimates for failed or short circuited seepage fields. First, no removal of nitrogen occurs in a failed seepage system and phosphorus removal can range from zero to eighty percent. Using those assumptions, seepage field loadings are estimated at 3,150 lb/yr total N and 150-740 lb/yr total P.

Combined, nutrient loading to Lake Bloomington from onsite waste systems is estimated at 8,400-9,500 lb/yr total N and 1,600-2,400 lb/yr total P. These loadings represent around 1% of the required N reduction and 23.4-35.5% of the required total P loading reductions.

The loading estimates can be refined by using actual water consumption data and by sampling a representative number of onsite waste system effluents over time. Loadings from failed or short circuited seepage systems will be more difficult to detect and measure.

This analysis utilizes numbers that likely result in an overestimate of the actual contribution from septic systems at Lake Bloomington. For example, we suspect that both the water usage and house occupancy (number of person equivalents per dwelling) values are less than the USEPA figures used. For example, neither the number of homes used as weekend and/or vacation and/or summer-only residence nor the number of older, childless residents are factored into the numbers used. These factors are expected to lower the final loading contribution estimate. A future site-specific assessment incorporating these factors is needed to provide a more precise site-specific estimate.

Cost Summary

Riparian Erosion Control Costs

Priority Shoreline Protection Areas:

Based on the erosion classes assigned during the shoreline erosion inventory the highest priority sites would be those in Erosion Class 6. These sites represent less than 12% of the unprotected shoreline, but produce nearly 60% of the sediment generated annually by shoreline erosion on Lake Bloomington. The Class 6 sites also represent by far the most cost effective treatment areas with the cost of a ton of soil saved at $151.37 for treatment or $3.03 per ton over a 50 year life of the shoreline protection. The next highest priority would be Erosion Class 5 and so on until all erosion classes are treated. There is limited benefit to treating the 50% of Lake Bloomington shoreline in Class 1 that produces only 3% of the annual sediment contribution from shoreline erosion. The table below shows the cost estimate per foot of bank treated for each Erosion Class and also the cost per ton of soil saved by Erosion Class.

Summary of Treatment Costs by Erosion Class

ESTIMATED COST OF ALTERNATIVE #6 FOR EACH EROSION CLASS							
Erosion Class	Total Length (ft.)	Total Tons Soil Erosion Annually	% Total Shoreline Erosion	Total Cost	Cost per Foot	Cost per Ton Soil	Cost per ton soil over 50 yr. life
1	27,962	114.5	3.03%	$316,364.00	$11.31	$2,763.00	$55.26
2	10,790	266.5	7.05%	$287,880.00	$26.68	$1,080.23	$21.60
3	3,256	235.6	6.23%	$148,616.00	$45.64	$630.80	$12.62
4	4,356	504.3	13.34%	$203,298.00	$46.67	$403.13	$8.06
5	2,670	413.9	10.94%	$134,404.00	$50.34	$324.73	$6.49
6	6,546	2246.9	59.42%	$340,110.00	$51.96	$151.37	$3.03
Totals	55,580	3781.7	100.00%	$1,430,672.00			

Table 16 Summary of Estimated Cost by Erosion Class

The Erosion Classes as defined reflect the severity of the erosion, but severity does not necessarily correlate well with treatment cost. This is mainly due to the fact that the lateral recession rate is a large factor in determining the Erosion Class, but the bank height and water depth at the shore are much larger factors in determining treatment cost. In Lake Bloomington the water depth near the shore does not vary a great deal.

The 2005 Study predicts approximately 3800 tons of sediment are generated annually in Lake Bloomington shoreline erosion. Nearly 60% of the sediment generated is coming from less than 12% (1.2 miles) of the unprotected shoreline classified as Class 6 Erosion. While study methods differ, the prediction of 3800 tons annual is very close to the 3950 tons predicted by Roger Windhorn, NRCS Resource Soil Scientist, in 1998.

Thus the study methods and assumptions made in the 2005 study seem to produce results consistent with earlier methods, yet provide a more detailed analysis of sites which will enable the City of Bloomington to direct resources where the most benefit will be achieved. By treating the Class 6 Erosion sites this study shows that nearly 60% of the sediment can be stopped by treating only 12% of the shoreline at an estimated cost of $340,000. If taken over the expected 50 year life of the shoreline protection the cost per ton of soil is only $3.03, while other less severely eroding sites have per ton cost 2 to 18 times higher. Erosion Classes 4 and 5, the next classes in order of severity can be treated for $338,000 to stop an additional 24% of the sediment produced by shoreline erosion; however the cost per ton saved will increase by about 250% to $7.60 per ton over the 50 year lifespan.

The recommended alternative is estimated cost of approx. $135,000 to treat the 2900 ft. of bank along the park area and roadway immediately East of the spillway. The average cost per foot is $46.55.

The cost of Armor Stone Breakwaters with Transitional Wetlands is approximately $60.00 per linear foot(IDNR, Outdoor Highlights, 7/07). The cost is comparable but higher than the traditional shoreline protection method recommended in the 2005 Study. In addition, the Armor Stone Breakwaters alternative can be installed at normal water levels, eliminating the need for significant draw-downs which can negatively impact recreational activity and reduce the City's on-hand water supply.

Streambank Stabilization Cost Estimates

LAKE BLOOMINGTON STREAM TREATMENT									
Preliminary Estimates of Quantities and Cost for Treatment									
Stream Segment	Length (feet)	Alt. No.	STP (feet)	Quantity Stone (tons)	Estimated Cost	Riffles (no.)	Quantity Stone (tons)	Estimated Cost	Total Cost Segment
Money	129,879	1	71975	53980	$1,619,400.00	0	0	$0.00	$1,619,400.00
Trib 1B	1320	1	260	130	$3,900.00	6	300	$9,000.00	$12,900.00
Trib 1C	2640	1	650	325	$9,750.00	0	0	$0.00	$9,750.00
Trib. 1D	2376	1	520	260	$7,800.00	5	500	$15,000.00	$22,800.00
Trib. 2A	2640	1	730	365	$10,950.00	8	560	$16,800.00	$27,750.00
Trib. 2B	1848	1	875	438	$13,140.00	6	500	$15,000.00	$28,140.00
Trib. 4	2904	1	290	145	$4,350.00	8	560	$16,800.00	$21,150.00
Trib. 5A	15576	1	1055	530	$15,900.00	0	0	$0.00	$15,900.00
Trib. 6A	4480	1	0	0	$0.00	0	0	$0.00	$0.00
Trib. 6B	4224	1	410	205	$6,150.00	0	0	$0.00	$6,150.00
Trib. 9A	10296	1	0	0	$0.00	0	0	$0.00	$0.00
Big Slough East	25080	1	4535	2725	$81,750.00	14	1400	$42,000.00	$123,750.00
Big Slough 2	7392	1	685	411	$12,330.00	0	0	$0.00	$12,330.00
Big Slough West	6705	1	1465	880	$26,400.00	0	0	$0.00	$26,400.00
Totals	**217,360**		**83450**	**60394**	**$1,811,820.00**	**47**	**3820**	**$114,600.00**	**$1,926,420.00**
Estimates based on Stone Cost of $30.00 per ton delivered and installed									

Agricultural BMP Costs

The cost summary for agricultural related practices would be just under $1.3 milion over a fifteen year period from all funding sources. Much of the funding is government supported with landowner costs ranging from a stipend payment to a 50-90% cost share with the land owner, depending on the program.

Program	Current average per year	Cost	Goal	Total Cost
Nutrient Management	10,000 acres	$12 per acre	15,000 acres per year	$540,000
No-Till and Strip-Till on cropland		$15 per acre,	6,000 acres	$90,000
Filter Strips	213 acres	$50 per acre, (10 Year) $75 per acre, (15 years)	150 acres 50 acres	$7,500 $3,750
Riparian Forest Buffers	6 acres	$200 per acre	5 acres	$1000
Contour Buffers		$50 per acre	10 acres	$500
Field Border	31.3 acres	$60 per acre	30 acres	$1,800
Windbreaks	9.7 acres	$50 per acre	10 acres	$500
Wetlands	12 acres	$3000 per acre	20acres	$60,000 (cost share)
Developing Incentives		$200 per acre	5 acres	$1000
Grade Stabilization	One Block Chute	Concrete Block Chutes- $6000 per unit Pipe Drops- $4000 per unit	10 units 30 units	$180,000 (75/25 cost share)
Grassed Waterways	39.8 acres	$2000 per acre	1100 acres	$220,000 (75/25 cost share)
Conservation Cover	68 acres	$200 per acre (10 year)	100 acres	$200,000
Prescribed Grazing	60 acres	$25 per acre (3 years)	100 acres	$7,500
Drainage/ Water Management		$30 per acre (3 years)	100 acres	9,000

Urban Cost

Urban Program Costs

On April 17, 2006 the Normal Town Council adopted an ordinance establishing a storm water utility fee payable by all property owners within the Town of Normal to generate funds to meet the regulatory requirements, goals and objectives of the storm water management plan. It is estimated that nearly $1.7 million in new annual revenue will be generated to offset cost to fully implement the storm water management plan.

Cost to implement the storm water management plan for those areas within the Town of Normal and the Lake Bloomington watershed will be included within the Town of Normal's overall storm water utility budget.

Initial one time costs:

Cost of the Urban Monitoring program would include a capital investment in monitoring equipment and an agreement with a university based research entity to perform data gathering, management and analysis, in addition to water collection.

Projected out for a five year program, the costs would be as follows:

INITIAL COSTS	ANNUAL COSTS	OVER 5 YEARS
Stream Flow Monitors- 7 @ $6,000 = $42,000	Supplies: $14,000	Initial Costs: $67,000
Samplers-7 =$25,000	Research Assistant: $12,000	Annual Costs for Five years- $310,000
	Usage and maintenance= $36,000	
Total: $67,000	Total: $62,000	Total: $377,000

Other urban alternatives include building a sewage treatment lagoon cluster system for the Lake Bloomington community and developed areas north of the Town of Normal incorporated areas. This alternative would cost over $9,000,000. A second alternative would be to connect the Lake Bloomington and suburban developments to the existing Bloomington Normal Water Reclamation District. This alternative would be over $10,000,000. The specific details of these two alternatives can be found in the Farnsworth plan in Appendix V.

Total costs for all suggested implementations	
Riparian	$ 5,410,350
Agricultural	$ 635,950
Urban (without alternative sewer systems)	$ 377,000
Total	$ 6,423,300

Selection of Implementation Strategies/Alternatives

The majority of the following implementation strategies will represent start dates for ongoing programs. Detailed strategies for implementation are found in the Implementation section of this plan.

The timeline for implementation (**pending funding**) is as follows:

Riparian Area :

Shoreline/streambank stabilization

- Development of updated streambank stabilization survey- 2010
- Development of headcut area survey- 2010
- Design of headcut stabilization- ongoing
- Lakeshore stabilization-
    - Plans for lakeshore stabilization-2009
    - Construction begins phase 1 (class 6)- 2010
- Streambank stabilization- 2011
- Headcut construction completed – 2011
- Inspection of construction on Tributary 5A- south edge of Towanda drainage area- 2008

Destratification

- Presently ongoing.

Wetlands-

- Identify potential partnerships- 2008
- Survey and inventory- 2008
- Site selection and planning – 2009
- Construction begins- 2011

Lake Parks BMPs

- Identify rain garden potential sites-2008
- Rain gardens construction -2009-11
- Start removal of invasives- 2008
- Start native plantings- 2008

Urban Area:

Public Education/Outreach

- Educational programs
    - Lake Bloomington specific programs - 2008
    - General public programs-2008

Public Participation/Involvement

- Storm water hotline (Normal) - 2007
- Expansion of storm water inlet stenciling program - 2008
- Formation:
    - Watershed(s) implementation committee - 2008

Illicit Discharge Detection/Elimination

- Continue GIS mapping of storm sewer outfalls- (begun 2007)

Construction Site Runoff Control

- Erosion & Sediment Control Ordinance (ESC) - 2008
- (ESC) permit & inspection program (Normal) -2008
- Explore possibility of County-wide ESC permit & inspection program- 2008

Post Construction Runoff Control

- Stream Buffer Ordinance - 2008

Pollution Prevention/Good Housekeeping

- Continue enhanced street sweeping program
- Continue storm drain inspection program
- Begin to install stream gauging/sampling stations- 2008
- Continue Integrated Pest Management certification for public employees.

Construction of sewer linkage from Lake Bloomington to BNWRD

- Alternative long range plan

Septic system inspection and replacement -

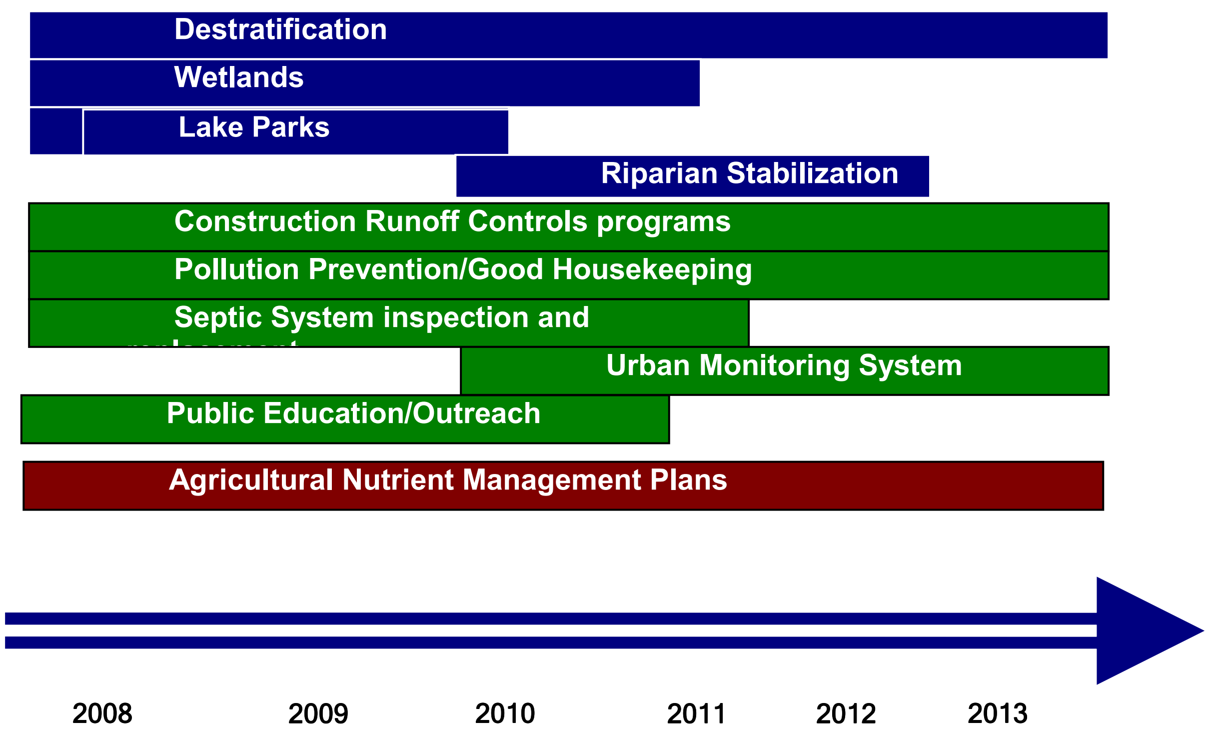
- Inspection and replacement for lease transfers- 2008
- Inspection for new construction- 2008
- Investigation of other BMPs used at other lake communities -2008

Agricultural Area:

Continue nutrient management- 2008

- No-Till and Strip-till on cropland-
- Filter Strips-

- Riparian forest buffers-
- Contour buffers-
- Field borders-
- Windbreaks-
- Developing landowner incentives-
- Grade stabilization program-
- Grassed waterways



Lake Bloomington Watershed Management Plan Timeline

Measuring Progress/Success

There are several plans already in the watershed which will record changes in the Lake Bloomington watershed after these plans are completed.

A secondary issue stemming from urban runoff is that there is very little monitoring of this runoff. An increased monitoring system is needed to pinpoint problems in the urban areas so further plans can be developed.

The primary purpose of an urban monitoring program is to measure contributions in runoff quantity and quality emanating from the urban development sites within the watershed. Storm water runoff from urban and urbanizing areas is recognized as a cause of water pollution.

The program would monitor flow, total Phosphorous(TP) and total Suspended Solids (TSS) contributions from the urban area, measured by analyzing flow-weighted composite samples, with frequency to be determined. Additional grab samples would be obtained for defined events.

Monitoring of storm water quality and quantity would be conducted as urban development progresses. In addition to quantifying the contribution from the urban area to the watershed, it could also provide important information on the differences between the addition of new traditional or "environmentally sensitive" development sites to each tributary. Information from this project could be shared with other communities through ongoing technical assistance and training programs administered by the NRCS, IEPA, and other agencies and organizations.

Aerial flights for mapping purposes to integrate the area into a GIS data grid will allow pinpoint changes to be monitored, especially in highly erosional areas.

A major component to the overall success of this plan is the appointing of an intergovernmental commission to oversee all watershed issues that affect McLean County. This committee will include representatives of all municipalities and community members to oversee the coordination, implementation, and updating of this and any other watershed plans as required.

Appendix I- Committee members

Lake Bloomington Planning Committee

Committee Chair:
Brian Brakebill, City of Bloomington

Co-Chair:
Bill Wasson, McLean County Parks and Rec

Secretary:
Judy Wilson, McLean County SWCD

Technical Writer:
Janet Beach Davis, Heartland Community College

Members:

Jill Mayes, City of Bloomington/Lake Bloomington
Rick Twait, City of Bloomington/Lake Bloomington
Kyle Haynes, City of Bloomington/Lake Bloomington
Jim Nelson, Association of Illinois Soil & Water Conservation Districts
Mike Hall, Town of Normal
Jennifer Sicks, McLean County Regional Planning
Rick Nolan, McLean County Regional Planning
Michelle Covi, Ecology Action Center
Caroline Wade, Illinois State University
William Rau, Illinois State University
Angelo Capparella, John Wesley Powell Audubon Society
Mary Jo Adams, Mackinaw River Partnership
Ken Browning, Lake Bloomington Homeowner's Association
Arnie Sepke, Lake Bloomington Homeowner's Association
Jeff Tracy, McLean County Highway Department
Mike Callahan, B/N Water Reclamation District
Randy Stein, B/N Water Reclamation District
Mark Beach, B/N Water Reclamation District
Bob Carter, B/N Water Reclamation District
John Hendershott, McLean County Health Department
Jim Rutherford, McLean County Soil & Water Conservation District
Kent Bohnhoff, Natural Resource Conservation Service
Jody Rendziak, Natural Resource Conservation Service
Randy McCormack, Natural Resource Conservation Service
Mike Garthaus, Illinois Department of Natural Resources
Maria Lemke, The Nature Conservancy
Tom Guth, Landowner/operator
Scott Clement, Landowner/operator
Greg Kelley, Landowner/operator
Terry Giannoni, Money Creek Township

Lake Bloomington Technical Advisory Committee

Chairman:
Rick Twait, City of Bloomington/Lake Bloomington

Co-Chair:
Mary Jo Adams, Mackinaw River Partnership

Members:

Brian Brakebill, City of Bloomington
Bill Wasson, McLean County Parks and Rec
Jill Mayes, City of Bloomington/Lake Bloomington
Kyle Haynes, City of Bloomington/Lake Bloomington
Mike Hall, Town of Normal
Angelo Capparella, John Wesley Powell Audubon Society
Janet Beach Davis, Heartland Community College
Rick Nolan, McLean County Regional Planning
Phil Dick, McLean County Building and Zoning
Darryl Coates, Illinois Department of Natural Resources
Mike Garthaus, Illinois Department of Natural Resources
Jim Nelson, Association of Illinois Soil & Water Conservation District
Linda Olson, McLean County Farm Bureau
Brian Lambert, McLean County U of I Extension
Joe Bybee, Illinois Department of Agriculture, Bureau of Land and Water
Jody Rendziak, Natural Resources Conservation Service
Kent Sims, Natural Resources Conservation Service
Keith Eichorst, Natural Resources Conservation Service
Kent Bohnhoff, Natural Resources Conservation Service
Randy McCormack, Natural Resources Conservation Service
Jim Rutherford, McLean County Soil & Water Conservation District
Judy Wilson, McLean County Soil & Water Conservation District
Maria Lemke, The Nature Conservancy
Bob Carter, B/N Water Reclamation District
Caroline Wade, Illinois State University
Bob Fish, Myers, Inc.
Ken Browning, Lake Bloomington Homeowner's Association
Arnie Sepke, Lake Bloomington Homeowner's Association
Larry Troyer, Landowner/operator
Terry Giannoni, Money Creek Township

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Appendix III- RAP-M

August 2007
R.D. Windhorn

LAKE BLOOMINGTON WATERSHED

INVESTIGATION CONDUCTED

An erosion/sedimentation inventory was conducted for Lake Bloomington watershed in McLean County. The watershed totals approximately 43,100 acres or about 67.3 square miles. Sediment Delivery Rates (SDR) for each type of erosion occurring within the watershed were also calculated. The main goal was to estimate total sediment load to the lake from the main branch of Money Creek and the major tributaries.

WATERSHED PHYSIOGRAPHY

The entire watershed lies within the Till Plains Section of the Central Lowland Province physiographic area. It is specifically located in the Bloomington Ridged Plain which is the unit that is more rolling and contains most of the Wisconsin glacial moraines located in Illinois. The El Paso Moraine lies to the northeast of the lake and this low ridge helps to funnel water into this watershed and direct it toward the lake. In most areas, Peoria Loess overlies glacial till of the Delavan Member of the Tiskilwa Formation of the Wedron Group (Wisconsin) that is generally loam or clay loam in texture. The Delavan Member is a brownish gray till that is calcareous and contains lenses of gravel, sand, silt and clay. The loess ranges from 4 to 6 feet in thickness over the general area, but can be thicker along the broad ridge tops and thinner on the eroded side slopes. Stream and gully dissection has exposed the underlying calcareous glacial till in a few areas along Money Creek and the major drainage ways.

The major stream valley is composed of deposits of Cahokia Alluvium (old) that is generally less than 20 feet thick. Sandy deposits of the Henry Formation can be below the alluvium along Money Creek but glacial till is probably below the alluvium on the upper reaches of the streams or where smaller tributaries join the main drains as they exit from the surrounding uplands. On the steeper slopes, where erosion has been more intense, the glacial till is occasionally exposed. Soils mapped in this watershed reflect the parent material differences discussed above. The surface texture of the soils in greater than 80% of the watershed is a silt loam, reflecting the characteristics of the loess cover that blankets nearly the entire region. The loess is quite erosive and is easily removed by running water. The alluvium in the stream banks can contain a variety of materials with a variety of textures and grain size content. This is especially noticeable where stones are present in the channel. Stability of the stream banks is greatly dependent on the shear characteristics of the material, and on a *watershed* scale, it is difficult to make “general” statements about overall conditions. Site specific determinations are essential for future stream bank stabilization activities.

GEOMORPHIC UNITS

The entire watershed was divided into "pieces" to analyze. To do this, three Geomorphic Units (GU) were set up. These Geomorphic Units are simply landscape units that are similar in geology, slope, soil, etc. and in anticipated response to erosion. These units are: **GU1**, Major floodplains and a few large wetlands (sinks); **GU2**, Upland flats and depressions with slopes generally 5% or less; and **GU3**, Upland, sloping areas, with slopes generally greater than 5%. **GU3** can be further subdivided into those sloping areas immediately adjacent to Lake Bloomington and the main stream channel and those sloping areas farther up in the watershed. Each GU produces differing sediment amounts depending on dominant erosion within it. Some, as in GU1, serve more as sediment "sinks" or deposition areas than they do as sources or eroding areas. Within GU2, there are a few areas that literally produce no sediment that will impact a surface water body. These areas are called Areas-of-No-Significant-Sediment (ANuSS). Generally they are relatively flat or even depressional areas of less than 2 percent slope that are not impacted by run-on water and are more than 2000 feet from a concentrated flow area (waterway, ditch, gully). These areas have a very low priority for *watershed land treatment*, in regards to affecting water quality at the outlet.

EROSION

At least six different types of erosion can produce sediment: sheet, rill, ephemeral, gully, streambank and shoreline. In the Lake Bloomington watershed, sheet and rill erosion values are computed from data gathered during the Erosion and Sediment Inventory. In NRCS, we use a process referred to as the Rapid

Assessment, Point Method (RAP-M) to statistically estimate erosion and sedimentation rates within any given watershed by sampling a portion and then expanding this data to fit the entire watershed. A Random-Stratified Sampling Procedure is used to select areas to be sampled. Generally these units are 160 acres in size, and are selected throughout the watershed, with an attempt to characterize all different land uses that are present. Inventory data collected in the field from these sites includes all information necessary to compute sheet, rill and ephemeral erosion losses. Using this data, an **annual sheet and rill** soil loss rate for each type of major land use within the watershed is determined. If the total number of acres for each land use is multiplied times this rate, a gross amount of sheet and rill erosion occurring within the watershed is estimated. From these same 160-acre sample units, gully or concentrated flow reaches are also selected, again using a random procedure.

Ephemeral or "annual gully" erosion is evaluated in the field by either actual measurement of area voided or by applying a standard formula to estimate the total erosion produced on an average **annual** basis. The rates produced using these methods are then projected and expanded to fit the rest of the watershed.

Gully erosion is measured in the field also within the above mentioned selected sample units. To obtain a representative sample of active gullies, additional gully segments were randomly selected adjacent to Lake Bloomington and the main Money Creek channel. These selected gullies or “concentrated flow areas” are walked and in-field measurements made on both the left and right banks in regard to severity of erosion or deposition. An erosion rate, called a “Lateral Recession Rate,” is applied to each measured section. These values are summarized and combined to produce an **annual** rate of erosion in tons or pounds of soil material removed per linear foot of gully. The estimated total length of gullies per sample unit is obtained by map wheel measurement from 7.5 minute quadrangle maps, with in-field checking and verification. This value is then expanded to fit the watershed, by first determining which GU unit is most affected by this type of erosion. In the Lake Bloomington watershed, GU3 contains virtually all of the "classic" gullies. So, this unit represents the entire watershed.

Stream bank erosion was evaluated in the Lake Bloomington watershed by Wayne Kinney, Stream Specialist, STREAMS, in March of 2006. In the stand-alone report, entitled “ASSESSMENT OF SEDIMENT DELIVERY AND STREAM CONDITIONS IN THE LAKE BLOOMINGTON WATERSHED” he explains how the streams were inventoried and the quantity of stream reaches evaluated. The summary of his work will be added to this report and will serve as the stream bank totals for erosion and sedimentation in this watershed.

An extensive shoreline erosion inventory was also conducted on this lake in November of 2005 by Wayne Kinney, Stream Specialist, STREAMS. This data is incorporated into this report and the information will be used exactly as it was recorded in the report titled, “LAKE BLOOMINGTON SHORELINE EROSION STUDY”, November, 2005, Midwest Streams Inc. Total shoreline erosion values are used in the overall erosion and sedimentation report.

SHEET AND RILL EROSION in Lake Bloomington Watershed

Sheet and rill erosion occurs on all land whether it is cultivated or not. It is a very natural, unending process. It is more of a concern when it is accelerated by man's activities. In the Lake Bloomington watershed, sheet and rill erosion was estimated, on a per acre basis, for all the dominant land uses. For cropland, evaluations were made for both the "A" and "B" slope areas (0 to 5%) and for the "C" slope and greater areas (5 to 10% +). These slope groups become quite significant from an erosion standpoint. Average rate of soil loss for A/B slope is 2.4 T/A/year. For C slope and greater areas, soil loss is 4.2 T/A/year. In the years immediately following the implementation of the 1985 Farm Bill, efforts by the landowners and operators to remain eligible for future farm programs prompted many of them to change their farming practices. Often times these changes included less tillage and leaving more residue on the surface. This helped to significantly reduce sheet and rill erosion on their fields.

Several other land use categories were also set up and evaluated. Areas of woodland that are generally relatively undisturbed on all slope ranges have a soil loss rate of only 1.0 T/A/year. Grasslands, CRP, and pastures areas were grouped together including all slope ranges. The rate for these areas was 1.2 T/A/year. Other land uses, which include transportation areas, wetlands, farmsteads, and urban areas were grouped together and assigned an erosion total.

Total sheet and rill erosion from **cropland** is estimated to be **94,910 tons per year**. This figures out to be about 2.4 T/A/year for **all** cropland. Sheet and rill erosion from **grassland** is about **3,100 tons** per year. **Woodland** areas are contributing **860 tons** per year and **Other Land** contributes about **430 tons**. **Total sheet and rill erosion** in the Lake Bloomington watershed is estimated to be **99,300 tons per year**. This is roughly 2.3 T/A/year for the entire watershed.

EPHEMERAL EROSION in Lake Bloomington Watershed

Ephemeral erosion occurs when tiny rills coalesce into small channels that tend to funnel water in a concentrated flow. These ephemeral, or “annual” gullies, are usually destroyed each year as the tillage for the year is completed. However, if the rate of erosion is great enough, the small channels will enlarge, even in a year’s time, to concentrated flow areas that are too large to be crossed with normal tillage implements. This becomes the beginning of the more classic perennial gully. These ephemerals generally begin to form where relatively flat or gently sloping soils break into steeper areas. Often times, they form on the edge of cultivated fields where the perennial vegetation is no longer in place to hold the soil during the higher flow times. In the past couple of years, more emphasis has been placed on attempting to measure the amounts of erosion from these gullies. For this field study, the length and grade of each ephemeral, and the type of tillage surrounding each of these was recorded. This information is then plugged-in to a predictive formula that has been developed to estimate tonnage of erosion, assuming one annual voiding. In this watershed, approximately **2,000 tons** of erosion can be contributed to the **ephemerals.** Most ephemerals in this watershed are associated with gently sloping cropland areas. The total is about 2% of the sheet and rill erosion totals which is probably lower than normal for watersheds in this physiographic area.

GULLY EROSION in Lake Bloomington Watershed

Gully erosion or concentrated flow erosion is estimated in the entire watershed by selecting random "reaches," evaluating these qualitatively to obtain quantitative values, and then expanding this data to fit the remainder of the watershed. The premise for this is that if enough segments are sampled, areas that are only slightly eroding as well as those that are severely eroding will be selected to evaluate. This percentage can then be used throughout the watershed with statistical validity. After the initial assessment, an additional number of samples were selected for further analysis. This was to insure adequate coverage of current, active gullies. These samples were primarily around Lake Bloomington. These samples also allowed for separation of **GU3** into two distinctly different landscape units from an erosion perspective. The qualitative assessment used to assign Lateral Recession Rates is one that bases observed physical features of the gullies with actual measured amounts from many Midwestern watersheds. In Lake Bloomington watershed, a few gullies near the lake contained "knickpoints" or small overfalls in the base of the channel. These can indicate recent down cutting and also indicate a difference in soil material. In areas where loess overlies glacial till a whole series of these knickpoints can be traced up some gullies. In regard to sediment production, each type of material produces different rates - the loess is most susceptible and will readily collapse into the gully and move off-site. The glacial till has more strength and is more difficult to erode. If it is exposed on a gully sidewall or along a streambank, the drying and re-wetting will cause it to "weather" or begin to break off in small pieces. When this happens, it, too, can be eroded and moved downstream. Glacial till generally contains the large stones and much of the sand and gravel that is observed in the streambed farther downstream.

According to the data collected in the field, the majority of the concentrated flow areas in the upper part of the watershed were already stabilized with water ways. No active gullies were considered for this inventory that were south of the town of Towanda. The gullies immediately adjacent to Lake Bloomington contribute about 280 tons of erosion on an annual basis and those along Money Creek, north of Towanda, contribute about 285 tons. In this watershed, approximately **565 tons** of erosion can attributed to the **active gullies.**

STREAMBANK EROSION AND SEDIMENTATION in Lake Bloomington Watershed

Streambank erosion in any watershed is a rather complex and detailed process. As the stream meanders across its valley or floodplain, "new" sediment is being added continually as the stream cuts into its banks. However, sediment is also being deposited in perhaps another portion of the stream as energy levels of the stream rise and fall. If the net effect remains somewhat constant over a period of years, the stream is considered "stable" and the changes are considered to be part of a "dynamic equilibrium" condition that exists within the watershed. If, however, this ongoing process is skewed one way or the other and either severe down cutting and bank caving predominates or extreme rates of sedimentation within the stream are occurring, then it is considered to be unstable. Many streams experience all of this variation if the total stream reaches from headlands to mouth are considered. To determine the magnitude of the dominant process occurring, the stream itself must be walked and evaluated. In most cases, **no other measured** stream bank data has been gathered in the past, so these **estimates** become the base for determining present sediment yield and future projections that would be modified by treatment measures in the watershed.

As was mentioned earlier in this report, the stream bank portion of this watershed was inventoried by Wayne Kinney in March of 2006. The data and other information presented here come directly from that report. A total of approximately 28 miles of channel were physically walked. Another 12 miles of tributaries and ditches were also considered which makes for a grand total of 40 miles of stream channels included in his report. This is considered to be a 100% sample of the perennial streams in this watershed. Stream bank erosion was calculated by estimating the length, height and lateral recession rate of each eroding streambank. Lateral Recession Rates or channel erosion rates were used to determine how much "bank retreat" is occurring on an average annual basis from vertical slopes.

Wayne found that nearly **1,260 tons** of sediment was being transported to the lake from the **stream system.** Nearly all was being generated by stream bank erosion in the main channel of Money Creek. The rates of sediment contribution ranged from a low of 1.7 tons per square mile to 77.8 tons of sediment per square mile.

SHORELINE EROSION in Lake Bloomington

In November of 2005, Wayne Kinney conducted an extensive shoreline erosion inventory of Lake Bloomington. He set up six different erosion classes, depending on the erosion severity. Erosion Class 1 is the least eroding and Class 6 is the most severe. From the report itself, "The erosion has been classified in 6 categories based on the bank height and the width of eroded cobble material left in the wake of the receding bankline." The total **shore line erosion** reported is **3756 tons** per year, with nearly 60% or 2247 tons coming from Erosion Class 6. One of the main reasons for the severity of the shore line erosion is due to the rise and fall of the lake level due to seasonal use and re-charge of the lake. The water-soaked shore line loses its strength when the lake level drops and the bank shear strength is not adequate to hold the slope in place and collapse occurs.

The sites most likely to be eroding are those on points that jut out into the lake and which may have several "faces" exposed to the wind and waves. More protected areas or those with less lake expanse in "front" of them have less overall erosion. The material generally exposed to the erosion is glacial till. Glacial till has a higher shear strength than the overlying silty loess, but will erode if the toe of the slope (bank) is undercut.

SEDIMENT DELIVERY RATE (SDR)

Only a portion of the sediment produced reaches a concentrated water source. Then, the stream system itself transports only a portion of what actually enters it. To account for this, Sediment Delivery Rates (SDR) are used. These factors are similar to the "Blue Book" value of a used car - for a car, you start out with a base value and then add to or subtract from that, depending on the options and mileage on the car. For this watershed, you start out with a "standard" value and then adjust this number up or down based on landscape characteristics. The Lake Bloomington watershed is somewhat complex when it comes to overland flow of water and sediment. It is a “youthful” watershed, geologically, with short, steep slopes along the major drains and longer, more gentle slopes away from the drains with relatively un-dissected plains near the upper reaches. What this means is that some of the sediment moves just to the base of the slopes while other sediment may move entirely through the watershed.

SDR's vary for each type of erosion, as would be expected. The sediment produced by sheet and rill erosion varies dramatically across this watershed. In the area surrounding the main Money Creek channel and the other major tributaries, sheet and rill *erosion potential* is greatest. The land is more sloping and the slopes are often short and “choppy.” Conversely, in the areas of the watershed where the slopes are longer and more gradual or the land is nearly level, the soils have a lower erosion *potential.* Along the path to a concentrated water flow area, many options are available for the sediment. Small sinks or traps are found within this watershed and include potholes, small ponds, wetlands, and even the flat parts of upland fields. In many cases, the floodplains can serve a very natural and useful purpose by also keeping sediment from entering the streams. Some of these "local" sinks effectively capture nearly 100% of the sediment produced above them in their subwatershed.

SEDIMENT DELIVERY RATES in Lake Bloomington Watershed

Sediment Delivery Rates (SDR) are used to predict the quantity of sediment that is “available for transport.” For example, sediment is produced on a sloping, cultivated field each year as the farmer chisel plows the field. The sediment moves down the slope and some of it becomes immobilized as it imbeds itself within the grass or is deposited where there is a change in slope. Some of it, however, is in a position near a waterway, or ditch, or shallow field channel that makes it available to move farther with the next storm event. SDR’s are developed for each type of erosion and often time, several are developed for sheet and rill erosion, based on where the slopes are within the watershed.

Sheet and rill erosion has the most complicated Sediment Delivery Rate because it involves sheet or laminar flow, as opposed to channel flow. Some of the factors involved in determining this are land slope, distance from a concentrated flow area, slope configuration, NRCS runoff curve number, and a surface roughness coefficient. Usually a base rate is determined for the conditions in the watershed or subwatershed, and then adjustments are made to that rate based on subsidiary conditions. A strong attempt is made to apply these criteria in a uniform and consistent manner throughout. Since sheet and rill erosion from the cropland areas was so varied, due to slope and land use, no single value of SDR seemed to suffice. For cropland areas, three different SDR’s were used. Woodland is one land use along the main stream tributaries and is comprised of those areas that are relatively undisturbed and those areas that have been disturbed by grazing. One SDR was used for all slope classes. Grasslands, CRP, pastures, etc. also had just one SDR applied to them. The five different SDR's used in this watershed for sheet and rill erosion ranged from 0.18 to 0.60.

Ephemeral, gully, and streambank erosion are all considered to be a form of “channel” erosion which have larger SDR’s because often time the erosion-produced sediment comes from the channel bottom and sides themselves, therefore naturally being more directly tied to delivery into the stream system. Ephemeral

SDR's commonly are in the 0.60 to 0.80 range. In the Lake Bloomington watershed, a value of 0.65 was used for all the ephemeral erosion sediment routing purposes.

Gullies serve as almost the "perfect funnel" to move sediment directly into the stream system. Gullies that lie immediately adjacent to the main channel have SDR's of 0.80 to 1.0. Gullies that occur on the extreme upper reaches of the watershed may have a range of 0.70 to 0.90. In this watershed, a rate of 0.85 was used for the gullies that are adjacent to the lake and a rate of 0.70 for those along Money Creek.

Streambank and shoreline sources have SDR's of 0.95 to 1.0. Literally everything that is eroded from the streambank or shoreline exposure falls in the stream or lake and is immediately available for transport. This is one of the reasons that even though the quantity of sediment produced by streams is not as great as from other sources, it is literally 100% "delivered". Sheet and rill produces large quantities of erosion and sediment, but only a fraction of it actually enters the system. Therefore, it is often times more important to treat the stream bank and shoreline areas because the sediment is much more "concentrated" and can often be considered a "point" source of pollution.

SEDIMENT TRANSPORT for Lake Bloomington

Sediment Transport is the final step in our erosion/sediment cycle. On smaller watersheds, this factor is incorporated into the Sediment Delivery Rates. It attempts to rate the overall effectiveness of the entire stream system in moving sediment through. Stream systems that are relatively small, have high gradients, and have small tributaries that reach to the upper segments of the uplands move sediment through completely and rapidly. Watersheds that are quite large with numerous locations for sediment to drop out, have low stream gradients, and have numerous undrained upland areas are much less efficient in moving the total sediment load. Sediment transport is based on several factors, including drainage density, drainage texture, relief/length ratios, valley slope of 3rd order streams, size of the watershed, type of sediment that is predominant, percent of the watershed "controlled" by natural or man-made sinks, stage of stream system development, etc. These factors are weighted and then applied to the Sediment Delivery Rates for the stream system in as uniformly and consistent manner as is possible.

Overall sediment delivery to Lake Bloomington involves several stages of transport. Sediment movement in the upland part is believed to be relatively slow. No-till and mulch-till fields, along with grassed waterways, help to keep the sediment in place or at least out of a more concentrated flow area. The stream channels here are moving through a loess-covered till plain. The loess can be as much as 6 feet thick. Bedload quantity is low with most of the sediment suspended, as the primary source is the loess soils and silty alluvial streambanks. As the stream continues, it eventually contacts the underlying glacial till. Down cutting slows somewhat as the shear strength of this material is greater than that of the loess. The channel reaches are somewhat U-shaped as they tend to widen at the base. They also support vegetation on the side slopes and toe slopes. As we move further downstream, the stream gradient decreases due to the elevated base level of the lake itself. Some bedload begins to settle out here and the water slows dramatically.

SUMMARY OF EROSION AND SEDIMENTATION IN LAKE BLOOMINGTON WATER SHED

In Lake Bloomington watershed, an estimated **106,800 tons of erosion** occurs on an annual basis from the six major types of soil erosion. If this number is divided by the number of acres in the watershed, a rate of about 2.4 tons per acre per year is obtained, when ALL sources of erosion are considered. Approximately **29,900 tons** of **suspended** and **bedload sediment** is actually **"delivered"** to the lake on a yearly basis. This estimated amount of sediment delivered is based on watershed-derived erosion and doesn't represent a measured amount at the outlet end. This gives an overall rate of 0.69 tons per acre per year or 445 tons of sediment per square mile of watershed when the entire watershed is considered. At 30 pounds per cubic foot, this calculates to be 45.7 acre-feet of sediment deposition on an annual basis or at 40 pounds per cubic foot, it calculates to be 34.3 acre-feet of deposition per year.

Roughly 68% of the suspended sediment comes from sheet and rill erosion on all cropland slopes. This land makes up the majority of the watershed with B slopes, 2-5% slope, dominating the crop fields. Approximately 5% is coming from ephemeral erosion (channel) which seems a little low for this type of watershed. Gullies or concentrated flow areas are only contributing about 2% of the total suspended sediment. About 5% comes from streambank erosion (channel). Surprisingly, shore line erosion contributes nearly 14 % of the suspended sediment total. The gullies, streambanks, and shore line sources contribute the majority of the bedload to the system. The A/B slope cropland areas appear to be contributing significant sediment but there is still much discussion on SDR rates for slopes less than 5%. It is believed presently that SDR **base rates** of 0.10 to 0.15 may be more appropriate. These lower rates would reduce sediment totals from the A/B slopes.

Bedload material is commonly sand and gravel and is very seldom measured as an output at the point of delivery, because of the cost and extensive sampling equipment that is necessary to complete this job. USGS gage stations do not routinely sample or measure this material. General estimates can be made, based on suspended sediment quantities. In Illinois, estimates of 5 to 30 percent of this total can be used.

In this case, roughly 3,900 tons were added to the total suspended load delivered of 26,000 tons to arrive at the total delivered sediment amount of 29,900 tons. In most cases, bedload type, composition, and grain size coming from the streambanks and shore lines is used extensively in channel design and channel geomorphology studies.

IN-LAKE SEDIMENT STUDY

An in-lake sediment survey was completed in summer and fall of 2005 by Hanson Engineers Inc. The purpose of these surveys is multiple, but one major objective is to determine amount of sedimentation that has taken place in the lake since the dam was closed. The accompanying objective is to then determine how much storage volume remains in the lake and if long-range changes in a lake management plan are needed. They concluded that between the years of 1929 and 1999 approximately 2,436 acre-feet of sediment has accumulated in the lake or about 34.8 acre-feet per year for the entire 70 years lifespan. (See complete report: "Bloomington Lake Sedimentation Survey" by Hanson Engineers Inc., January 5, 2000)

If we compare the sediment that has accumulated in the lake to that which is estimated by this inventory, we can validate both methods and increase the degree of reliability of these projects. Bulk density of the sediment was not directly determined in their survey. If we assume 30 pounds per cubic foot, the total from our inventory would be 45.7 acre-feet on an average annual basis. If we assume 40 pounds per cubic foot, our acre-feet of annual sediment accumulation would be about 34.3. It appears from this that both the "watershed estimate" and the "sink estimate" were very similar. This gives us a certain degree of reliability in the processes that were applied within this watershed.

CONSIDERATIONS FOR EROSION AND SEDIMENT CONTROL

1. Concentrate any *land treatment* alternatives on the sloping (>5%) areas that lie immediately adjacent to the lake or creek for the most effective land treatment control. In other words, the "flat" land doesn't really produce much sediment that reaches the lake so let's not spend unproductive time and effort here.

2. If needed, select a pilot subwatershed and concentrate land treatment or structural control efforts here. From this base a better estimate as to effectiveness of these controls could be made for the remainder of the entire watershed. These smaller subwatersheds also give the local people a better visual example of how their control methods will work.

3. Select highly visible or locally known eroding sites for demonstration areas, particularly if streambank stabilization or shoreline stabilization is included as part of the project. Easier to point at these to show how effective local efforts have been.

4. If structural measures are used in the watershed, it is important to remember that they generally will control the **sediment** produced from **all types of erosion** above them in their subwatershed. This is an important point from a watershed management perspective: s*tructures control sediment more so than erosion.* What do I mean? If a structure (WASCOB, pond, dry dam, etc.) is placed in a drainageway and surface water runs into it or through it, a sediment reduction will occur due to the trapping efficiency of the water pool. The surface water might be carrying sediment derived from sheet, rill, ephemeral, and gully erosion but much of the suspended and nearly all the bedload is trapped, regardless of the source. These small structures will also dramatically reduce the peak runoff flows developed during rainfall events. The magnitude and timing of these peak flows can significantly affect channel erosion and overall movement of sediment within a given subwatershed. It is more efficient and effective, in general, to have these structures as "low" in the watershed as is possible. The more of a subwatershed that occurs above them, the greater the amount of the runoff and sediment that is "controlled." A caution always has to be mentioned when

dealing with "cleaned" water, in that, if the water channels are silts and fine sands, the additional energy of clean water can lead to accelerated channel erosion below these structures. Stabilization and sediment reduction always have to be handled in combination during any engineering design.

5. Stream bank and shore line stabilization projects attack localized sediment production directly. However, they don't deal with reducing sediment that is already in the lake or stream system from other sources.

6. If significant land use changes, such as increased urbanization, are anticipated in a certain segment of the watershed, these areas should probably be monitored more closely because of the potential for more rapid change in sediment rates. Even relatively small areas of highly disturbed land can significantly increase the sediment load on the stream system.

7. Watersheds of this size do not have one easy solution to all the erosion and sediment concerns. Cost of treatment versus tons of soil (sediment) saved is always a consideration for implementation strategy. Often time combinations of solutions are most effective since they tend to reinforce the effectiveness each one has individually.

8. Sometimes on watersheds where conservation tillage, conservation cropping systems, and no-till systems are already in-place, the "best scenario" possible from a sediment reduction standpoint is probably no more than 25 to 30 percent without some types of structural sediment basins.

9. Need to recognize the differences between sediment sources and their effective means of control. Sheet and rill erosion and the sediment it appears to produce always *seems significant* because nearly all the land in the watershed is producing it. Remember that *many acres* of land need to be treated before *sediment* control efforts will begin to pay off at the lower end of the watershed. With streambank and shore line erosion, stabilization projects have an almost immediate effect on sediment reduction and movement within

the stream. I suggest that more than just "totals" are evaluated within a watershed when considering treatment – look also at feasibility of solution, cost:return benefits of solution, and ease with which the solutions can be blended into an overall sediment reduction plan for the watershed.

10. All totals for erosion and sedimentation in this report are given in "average annual" figures. There are some inherent dangers in this because in some years, the amount projected will vary significantly from that amount actually produced. Our procedure is considered more appropriate for "planning purposes" than for site-specific "engineering purposes." Use ALL totals as first-order estimates – NOT an absolute number!

Erosion and Sediment Totals for Lake Bloomington

	Erosion (tons)	SDR	Sediment Delivered (tons)
Sheet / Rill			
Cropland			
A/B	93,100	0.18	16,760
C/C+	1,810	0.55	1,000
Grassland, CRP, etc.			
All Slopes	3,100	0.25	775
Woodland			
All Slopes	860	0.60	520
Ephemeral	2,000	0.65	1,300
Gully			
Lake side	280	0.85	240
Money Creek	285	0.70	200
Streambank	1,260	1.0	1,260
Shoreline	3,756	1.0	3,760
TOTAL	**106,800**		**26,000**

SUBTOTAL - Suspended Sediment		26,000
Estimated Bedload	(15%)	3,900
Sediment Transported to the Lake		**29,900 Tons**

COMPARISON OF TWO ADJACENT WATERSHEDS

Evergreen Lake and Lake Bloomington are both used to provide a water supply to the City of Bloomington. They lie nearly adjacent to one another, separated just a few miles east to west. They are in the same physiographic unit and both are on a loess covered glacial till plain. Both watersheds are primarily agriculture, with urban encroaching on both, presently more on Lake Bloomington. Both watersheds are subject to large lake level changes over the course of a year because of heavy seasonal water use and re-charge within each watershed.

Erosion rates are similar but slightly different as might be expected. Evergreen Lake has erosion rates for A/B slopes of 1.3 T/A/year, while Lake Bloomington has rates of 2.4 T/A/year. This could be due to more reduced tillage system being used in the Evergreen Lake watershed or more of an influence in the sampling of A slopes as compared to B slopes. Steeper slopes of C/C+ were reversed. Evergreen Lake watershed had rates of 7.1 T/A/year compared to 4.2 T/A/year for Lake Bloomington. Evergreen Lake has more sloping cropland than Bloomington which might contribute to a better sampling distribution. Average annual erosion rates for ALL cropland in each watershed were similar. In Evergreen Lake, a rate of 1.9 T/A/year and in Lake Bloomington about 2.4 T/A/year. Not sure the difference is statistically significant, but could indicate more "conservation applied" in Evergreen Lake.

Ephemeral erosion was probably the most noticeable between the watersheds. Totals in Evergreen Lake were about 9% of the sheet and rill totals which is in the "normal" range. Totals in the Lake Bloomington were about 2% of the sheet and rill which is less than expected. I believe some of this is due to the greater acreage of C slope cropland in Evergreen Lake. Gully and concentrated flow erosion was three times as much in Evergreen Lake as Lake Bloomington. Once again, I attribute this to a greater degree of dissection present in Evergreen, even in the gullies immediately adjacent to the lake. Streambank erosion was much more prevalent in Evergreen with higher overall totals and a higher erosion rate. There is more down cutting of the stream system in Six Mile Creek above Lake Evergreen than in Money Creek above Lake

Bloomington. There is not a “system-wide” stream instability problem in Money Creek (STREAMS, 2006) which means less overall stream bank erosion.

Shoreline erosion is a problem in both lakes. As mentioned earlier, much of this is due to the seasonal drawdown of the lakes for increased water use and then the accompanying recharge. This wet-dry cycle can produce shore line banks that are unstable and more likely to collapse. More shoreline erosion in Lake Bloomington which can be attributed to a somewhat larger body of water and the lake that annually undergoes more wet-dry cycles and more pronounced cycles of water variations.

Sediment delivery is similar for both watersheds. Sediment transport capability of the entire stream system probably favors Evergreen Lake, as it has higher gradient and more complete dissection of the upland.

Overall, more sediment is being delivered to Lake Bloomington than to Lake Evergreen on an average annual basis. This is a product of the factors mentioned above plus the fact that the watershed is roughly 1.5 times the size of Lake Evergreen watershed. Common solutions to some of these erosion and sedimentation problems exist, with more emphasis needed in Lake Evergreen for stream bank erosion control and more emphasis in Lake Bloomington for shore line erosion control.

Appendix IV- Stormwater Ordinance

Appendix IV

Model Watershed Ordinance

100.0 Findings and Purpose	**100.0 Findings and Purpose**
101.0 Findings	**101.0 Findings**
The (City Council, County Board, Board of Trustees) of the (County of McLean, City of Bloomington, Town of Normal, Village of________) hereby finds that:	This section identifies a range of circumstances which threaten the public health, safety, or welfare and from which protection is sought by the enactment of this ordinance. At a number of points in the ordinance, the name of the unit of local government enacting it is to be entered. While the references in this model are to a village, the ordinance is also applicable to a city or county. The reference to the Board of Trustees may be changed to City Council or Board of Commissioners as appropriate.
101.1 Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;	
101.2 The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;	
101.3 Soil erosion necessitates the costly repairing of gulleys, washed-out fills, and embankments;	
101.4 Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, wetlands, and reservoirs;	
101.5 Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and	
101.6 Sediment reduces the channel capacity of waterways and the storage capacity of floodplains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.	
102.0 Purpose	
The (Board of Trustees) therefore declares that the purpose of this ordinance is to safeguard persons, protect property, prevent damage to the environment, and promote the public welfare by guiding, regulating and controlling the design,	

construction, use and maintenance of any development or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth on land situated in the(village). It is the intention of this ordinance that the delivery of sediment from sites affected by land disturbing activities be limited, as closely as practicable, to that which would have occurred if the land had been left in its natural undisturbed state.	

200.0 Definitions For the purposes of this Ordinance certain terms used herein are defined as set forth below:	**200.0 Definitions** The local government adopting the ordinance may wish to expand or shorten the list of definitions provided here, depending on the terms already defined in other ordinances or regulations.
200.1 BUILDING PERMIT	
A permit issued by the (village) for the construction, erection or alteration of a structure or building.	
200.2 CERTIFY OR CERTIFICATION:	
Formally attesting that the specific inspections and tests where required have been performed, and that such tests comply with the applicable requirements of this Ordinance.	
200.3 CLEARING	
Any activity which removes vegetative ground cover.	
200.4 CUBIC YARDS:	
The amount of material in excavation and/or fill measured by the method of "average end areas."	
200.5 EXCAVATION:	
Any act by which organic matter, earth, sand, gravel, rock or any other similar, material is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting therefrom.	
200.6 EXISTING GRADE:	
The vertical location of the existing ground surface prior to excavation or filling.	
200.7 FILL:	
Any act by which, earth, sand, gravel, rock or any other material is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.	
200.8 FINAL GRADE:	
The vertical location of the ground or pavement surface after the grading work is completed in accordance with the site development plan.	
200.9 GRADING:	
Excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.	

200.10 NATURAL DRAINAGE:	
Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.	
200.11 PARCEL: ***All contiguous land in one ownership.***	***All contiguous land used or legally described and recorded as a single unit.***
200.12 PERMITTEE:	
Any person to whom a site development permit is issued.	
200.13 PERSON:	
Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, and the United States, of America, its agencies and instrumentalities, and any agent, servant, officer or employee of any of the foregoing.	
200.14 REMOVAL:	
Cutting vegetation to the ground or stumps, complete extraction, or killing by spraying.	
200.15 SITE:	
A lot or parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.	
200.16 SITE DEVELOPMENT: ***Altering terrain and/or vegetation and constructing improvements.***	Definition of development in Subdivision code needs to be revised in Normal, (COB, County?) to remove the grading exception.
200.17 SITE DEVELOPMENT PERMIT:. ***A permit issued by the (village) for the construction or alteration of ground improvements and structures for the control of erosion, runoff and grading.***	***This is the equivalent of Erosion and Sediment Control permit.***
200.18 STREAM:	**200.18 STREAM:**
Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.	For purposes of this ordinance, a stream does not include very small headwater swales or ditches which generally would not be mapped on U.S.G.S. 7.5 minute quadrangle maps.
200.19 STRIPPING:	
Any activity which removes the vegetative surface cover including tree removal, clearing, and storage or removal of topsoil.	
200.20 VACANT:	
Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.	

200.21 VILLAGE:	**200.21 VILLAGE:**
The Village of , County, Illinois.	Identification of the City or County should be substituted in the appropriate alphabetic position where one of these is the unit adopting the ordinance.
200.22 WETLANDS:	**200.22 WETLANDS**
Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. ***For the purpose of this ordinance, wetlands shall be defined by the Illinois Department of Conservation National Wetlands Inventory maps.***	In the context of this ordinance, wetlands are intended to refer to areas which are subject to regulations of the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. It is not intended that very small areas meeting the wetland definition (e.g., a roadside ditch) would be subject to the special provisions of this ordinance which require an erosion and sediment control permit for very minor disturbances. ***Wetlands: Additional references include Wetland Plants of the State of Illinois, 1986, Hydraulic Soils of the State of Illinois, 1985, and A Field Guide to the wetlands of Illinois, Illinois Department of Conservation, 1988.***

300.0 General Principles It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the (village). Measures taken to control soil erosion and offsite sediment runoff should be adequate to assure that sediment is not transported from the site by a storm event of ~~ten~~-***five-year*** frequency or less. The following principles shall apply to **all** development activities within the (village) and to the preparation of the submissions required under Section 400.0 of this ordinance:	**300.0 General Principles** The approaches outlined here have been proven effective in minimizing soil erosion from development sites and in reducing the damaging effects of that erosion which does occur. They should serve as guidelines for the preparation of site development and erosion control plans required under Section 400.0, and in the conduct of development activities which are exempted from the permit requirements of this ordinance. The erosion and sedimentation control practices discussed in this ordinance and the manual of "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (prepared by the Northeastern Illinois Erosion & Sedimentation Control Steering Committee, in cooperation with area Soil and Water Conservation Districts and the U.S. Soil Conservation Service, and known as the Green Book) are designed to provide protection against sediment leaving the site during a ten-year storm. ***Five year frequency was used to conform with IEPA minimum requirements.***
300.1 Development should be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes where high cuts and fills may be required should be avoided wherever possible, and natural contours should be followed as closely as possible.	
300.2 Natural vegetation should be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands should be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.	**300.2** In its floodplain and wetland protection model ordinances, NIPC recommends that a minimum 25 foot buffer strip be preserved along waterbodies and wetlands. It is recognized that mitigation wetlands will involve disturbance in their immediate proximity. In these situations, the time of disturbance should be kept to a minimum.

300.3 Special precautions should be taken to prevent damages resultant from any necessary development activity within or	

adjacent to any stream, lake, pond, or wetland. Preventative measures should reflect the sensitivity of these areas to erosion and sedimentation.	
300.4 The smallest practical area of land should be exposed for the shortest practical time during development.	
300.5 Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures should be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development.	
300.6 The selection of erosion and sedimentation control measures should be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.	
300.7 In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance should be considered.	
300.8 Provision should be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion onsite or downstream.	
300.9 Permanent vegetation and structures should be installed and functional as soon as practical during development.	
300.10 Those areas being converted from agricultural purposes to other land uses should be vegetated with an appropriate protective cover prior to development.	
300.11 All waste generated as a result of site development activity should be properly disposed of and should be prevented from being carried off the site by either wind or water.	
300.12 All construction sites should provide measures to prevent sediment from being tracked onto public or private roadways.	
400.0 Site Development Permit	**400.0 Site Development Permit**
401.0 Permit Required	**401.0 Permit Required**
Except as otherwise provided in this ordinance, no person shall commence or perform any clearing, grading, stripping, excavating, or filling of land which meets the following provisions without having first obtained a site development permit from the (permitting authority) of the (village).	The requirement of a site development permit is the means by which the local government can assure that adequate steps are taken before and during development to control erosion and its effects. The adopted ordinance should specify the official or department (the "permitting authority")

	responsible for issuing permits, inspecting work in progress, and taking enforcement action if necessary. In most cases, this will be the administrative official responsible for other aspects of development regulation. Depending on practice in the particular local government, this may be the Building Officer, Zoning Officer, Plat Officer, Engineer, or other official with related responsibilities including enforcement authority. Identification of this authority should also be included among the definitions in Section 200.0.

401.1 Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area in excess of 5000 square feet;	
401.2 Any land disturbing activity that will affect an area in excess of ~~500~~ ***1,000*** square feet if the activity is within 25 feet of a lake, pond, stream, or wetland; or	
401.3 Excavation, fill, or any combination thereof that will exceed 100 cubic yards.	
402.0 Exceptions	**402.0 Exceptions**
A permit shall not be required for any of the following provided that the person responsible for any such development shall implement necessary soil erosion and sediment control measures to satisfy the principles set forth in Section 300.0 of this Ordinance:	For certain soil-disturbing activities, it may be unnecessary or impractical to require application for and issuance of a permit. This is due to the type or scale of development activities involved. These exceptions should be clearly specified in the ordinance. On development sites below a minimum size, it may be impractical to require the developer to prepare full site development and erosion control plans, given the relatively small area of soil disturbance. However, effective erosion and sedimentation controls should still be required during development to avoid silting of streets and drainage channels and offsite water quality impacts. The local government may wish to include the requirement of basic erosion and sedimentation control measures as a condition for issuance of a building permit in such cases. Some local governments may wish to establish a more restrictive minimum area for the issuance of permits than the 5000 square feet suggested here. This would be appropriate in areas of relatively steep slopes or erodible soils, in addition to areas involving streams, lakes, and wetlands referenced in the ordinance. An alternative approach is to base the need for a permit on the anticipated soil loss from the site during development. A model ordinance developed in Ohio limits erosion from development sites to an average annual soil loss of 15 tons/acre/year. Such a quantitative standard can take into account the existence of small but steep and highly erodible lots on which stringent erosion controls may be necessary, and larger but extremely pervious and flat areas, from which erosion may not be a serious problem. However, the most common soil-loss estimation techniques are not applicable to sites of much less than 50 acres, making the

	administration of such an ordinance impractical. The present model ordinance contains procedures for the granting of exceptions which may be applied to unique development sites.
402.1 Excavation below final grade for the basement and footings of a single-family residence and appurtenant structures on a site in excess of ~~two~~ ***five*** acres for which a building permit has been issued by the (village);	**402.1** This provision permits the construction of single residences in estate-zoned or agricultural areas where much potential sediment may be absorbed by the site itself. Again, the local government should include basic sediment control measures in its building permit requirements.
402.2 Agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Soil and Water Conservation District, and including the construction of agricultural structures;	**402.2** ***Agricultural Land - Land in farms regularly used for agricultural production. The term includes all land devoted to crop or livestock enterprises, for example, the farmstead lands, drainage and irrigation ditches, water supply, cropland, and grazing land of every kind in farms.***
402.3 Installation, renovation, or replacement of a septic system to serve an existing dwelling or structure.	

403.0 Application for Permit	**403.0 Application for Permit**
Application for a site development permit shall be made by the owner of the property or his authorized agent to the (permitting authority) on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee of __. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit. Each application for more than five acres shall be signed by a licensed professional engineer.	The application form for the permit can be relatively brief. It need contain only (1) identification of the applicant and of the person or firm responsible for development activity and for preparation of the required plans, (2) identification of the plans and other documents submitted with the application, and (3) certification that development will take place in accordance with the plans as approved upon issuance of the permit. The local government may wish to require that each application be signed by a licensed professional engineer as an assurance of the technical validity of the submissions. The filing fee is intended to defray the local government's cost of reviewing and acting upon the permit application. The amount of the fee should be consistent with existing practice of the local government, and may either be a flat amount or be based on a sliding fee scale related to the size and character of the proposed development. It may also be desired to provide for a separate supplemental fee where a hearing is required on an exception requested under Section 600.0.
404.0 Submissions	**404.0 Submissions**
Submitted permit applications shall be in conformance with site development guidelines of chapter __ §__.	
405.0 Bonds	**405.0 Bonds**
The applicant for a permit to disturb five acres or more is required to file with the (jurisdiction) a ~~faithful~~ performance bond or bonds, letter of credit ***or cash*** oth~~er improvement~~	The filing of a performance bond by the developer may be made mandatory with respect to all developments or left at the discretion of the permitting authority. Some local

~~security satisfactory to the (municipal attorney)~~ in an amount deemed sufficient by the (permitting authority) to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the (jurisdiction), and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.	governments in northeastern Illinois have specified the amount of the performance bond as a percentage of the cost of improvements and erosion controls on the site. Bonds for development performance and maintenance may be separate. Where permanent maintenance will be assumed by an agency or entity other than the developer, the time period of the maintenance bond should be limited accordingly.
406.0 Review and Approval	
Each application for a site development permit shall be reviewed and acted upon according to the following procedures:	
406.1 The (permitting authority) will review each application for a site development permit to determine its conformance with the provisions of this ordinance. The (authority) may also refer any application to the ***McLean County*** Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comment. Within thirty (30) days after receiving an application, the (permitting authority) shall in writing: a. Approve the permit application if it is found to be in conformance with the provisions of this ordinance, and issue the permit; b. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or **c. *Request changes and/or additional information,*** necessary to secure substantially the objectives of this ordinance, ***and the procedure for submitting a revised application.*** d. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.	**406.1** A reasonable time limit should be placed on local government action on permit applications in order to minimize the serious financial costs to the developer of delays. Informal review of the project prior to submittal of the final application can contribute to this objective. The Soil and Water Conservation Districts have specialized expertise in soils analysis and erosion control techniques. The quality of local plan reviews may be improved by referring projects to the appropriate District for advisory technical review. Review of some projects (e.g., subdivision of agricultural lands) within the overlapping jurisdiction of the local government and a District may be required under 5 Ill. Rev. Stat. 127.2a. Communities which do not wish to retain specialized staff may choose to enter into a contract or intergovernmental agreement with the District for the conduct of all reviews and the preparation of recommended actions. Approval or disapproval of applications would remain the responsibility of the local government. Where another public body (such as a park district) is to assume ownership and/or maintenance responsibility for part of a development, it should also be given an opportunity to review the development plans. This review should be completed within the 30-day period allowed the permitting authority, in order that the permitting authority may take action on the application within the time allowed.
406.2 No site development permit shall be issued for an intended development site unless: a. the development, including but not limited to subdivisions and planned unit development, has been approved by the (jurisdiction) where applicable, or ~~b. such permit is accompanied by or combined with a valid building permit issued by the (jurisdiction), or~~ ~~c. the proposed earth moving is coordinated with any overall development program previously approved by the (jurisdiction) for the area in which the site is~~	**406.2** Before earth movement begins, the local government will wish to be assured that the proposed development will comply with all applicable regulations. This can be done by mandating that the other required approvals or permits be secured prior to or concurrent with the site development permit, or by finding that the proposed earth moving is related to an annexation agreement, planned unit development, or other approved development program. ***b. Erosion control permit should be issued prior to the issuance of a building permit.*** d. This paragraph is not intended to address all federal and

~~situated; and~~ d. all relevant federal and state permits (i.e., for floodplains and wetlands) have been received for the portion of the site subject to soil disturbance.	state permits, only those relevant to soil erosion and sediment control. For example, a site development permit could be issued while a developer awaits final IEPA approval regarding wastewater service.
406.3 Failure of the (permitting authority) to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed unless such time is extended by agreement between the (permitting authority) and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the (permitting authority).	**406.3** This provision is directed at reducing development costs by avoiding delays in government action. When some aspects of a proposed plan require modification, it may be reasonable to permit other parts of development to proceed as long as they do not render the modifications nugatory.

407.0 Expiration of Permit	**407.0 Expiration of Permit**
Every site development permit shall expire and become null and void if the work authorized by such permit has not been commenced within ~~one hundred and eighty (180) days~~, ***one year*** or is not completed by a date which shall be specified in the permit; except that the (permitting authority) may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The (permitting authority) may require modification of the erosion control plan to prevent any increase in erosion or offsite sediment runoff resulting from any extension.	Because the erosion control measures required on a site are related to seasonal variations and other factors, changes may be required if the development does not proceed on the anticipated schedule. Some communities in northeastern Illinois have established 90 days (rather than 180) as the period within which development should begin. It is suggested that any fixed completion date be omitted from the ordinance and that this date be specified in the permit itself, relating the date to the developer's proposed schedule.
408.0 Appeals	**408.0 Appeals**
The applicant, or any person or agency which received notice of the filing of the application, may appeal the decision of the (permitting authority) as provided in Section 406.0, to the (board of appeals). Upon receipt of an appeal, the (board of appeals) shall schedule and hold a public hearing, after giving 15 days notice thereof. The (board) shall render a decision within thirty (30) days after the hearing. Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil ~~or rock~~ which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.	Provision should be made for the appeal of administrative decisions to a policy body of the local government. Appeal should be available to the applicant or to any body (e.g., the local Planning Commission or Soil and Water Conservation District), which has received the permit application for review. The ordinance should specify the body responsible for hearing and acting upon appeals, and for granting exceptions to the ordinance under Section 600.0. Depending on local practice, this may be the Zoning Board of Appeals, the Council or Trustees or Commissioners or its Planning or Development Committee, or the Planning Commission. The body should be identified among the definitions in Section 200.0. It may be desired to provide that this body seek a recommendation from those bodies which themselves have the right of appeal before it acts.
409.0 Retention of Plans	
Plans, specifications, and reports for all site developments shall be retained. ~~in original form or on microfilm by the (permitting authority).~~	

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<tr><th>500.0 Design and Operation Standards and Requirements</th><th>500.0 Design and Operation Standards and Requirements</th></tr>
<tr><td>501.0 Applicability</td><td>501.0 Applicability</td></tr>
<tr><td>All clearing, grading, stripping, excavating, and filling which is subject to the permit requirements of this ordinance shall be subject to the applicable standards and requirements set forth in this Section 500.0.</td><td>It is reiterated that developments which are exempted from the permit requirements of this ordinance are still required to take actions to control erosion and sedimentation leaving the development site, and that those actions shall be generally consistent with this Section 500.0.</td></tr>
<tr><td>502.0 Responsibility</td><td></td></tr>
<tr><td>The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the (village) or its officers or agents will not be made liable for such damage, by (1) the issuance of a permit under this ordinance, (2) compliance with the provisions of that permit or with conditions attached to it by the (permitting authority), (3) failure of (village) officials to observe or recognize hazardous or unsightly conditions, (4) failure of (village) officials to recommend denial of or to deny a permit, or (5) exemptions from the permit requirements of this ordinance.</td><td></td></tr>
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<tr><th>503.0 Site Design Requirements</th><th></th></tr>
<tr><td>503.1
On-site sediment control measures, as specified by the following criteria, shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

a. For disturbed areas draining less than 1 acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all offsite runoff as specified in referenced handbooks. Vegetated filter strips, with a minimum width of 25 feet, may be used as an alternative only where runoff in sheet flow is expected.

b. For disturbed areas draining more than 1 but less than 5 acres, a sediment trap(s) or equivalent control measure(s) shall be constructed at all downslope point(s) of the disturbed area.

c. For disturbed areas draining more than 5 acres, sediment basin(s) or equivalent control measure(s) shall be constructed at the downslope point(s) of the disturbed area.</td><td>503.1

a. Filter barriers are appropriate sediment control measures for small drainage areas where concentrated flow is not present. Existing references specify a range of appropriate drainage areas for their application. The Green Book recommends that filter barrier usage be limited to 1/2 acre drainage areas, except for individual lots where the drainage area may be increased to 1 acre. Draft USEPA guidance allows filter barriers for drainage areas up to 10 acres.

The Green Book recommends a minimum vegetative filter width of 15 feet to protect adjacent property or streams. While there is no clearly recognized standard for this width, NIPC recommends 25 feet for consistency with its stream and wetland protection ordinance and floodplain ordinance.

b. Sediment traps or basins are required to control sediment runoff in situations where concentrated or channelized flow is likely to be present. Generally speaking, sediment barriers such as silt fences are ineffective and unreliable in such situations. In particular, they are subject to undercutting and blowout due to high water velocities.

It is recommended that the construction of sediment traps or basins be coordinated with the needs for</td></tr>
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stormwater detention. If properly designed, located, and maintained, sediment basins can be readily converted to permanent detention basins after the site is fully stabilized

d. Sediment basins and sediment traps designs may provide for both detention storage and sediment storage. ~~The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each~~ Sediment basins and sediment traps shall be sized for the 2-year, 24- hour runoff from the site under maximum runoff conditions during construction. The release rate of the ***sediment*** basin shall be that rate required to achieve minimum detention times of at least ~~10~~ ***8*** hours. ~~The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.~~

d. Capacity must be provided in sediment basins for both sediment storage and detention storage. The detention storage detains the water for a sufficient period of time settle out the eroded sediment. The sediment storage stores the settled sediment so that there is no loss of detention storage during the life of the sediment basin.

Both "wet" detention storage and "dry" detention storage are needed to maximize the effectiveness of the sediment basin. The total detention storage equal to twice the volume needed to detain the 2-year, 24-hour runoff for ten hours is approximately equal to the 10-year detention storage recommended by the Green Book and also recommended in draft USEPA guidance. For a typical site, this combined wet/dry storage is equivalent to 2.0 inches of runoff from the site.

The wet portion of the detention storage contains a permanent pool which drains by evaporation and infiltration only. The permanent pool prevents resuspension of previously deposited sediment and creates better settling conditions than a basin with no wet detention storage by reducing the energy of the incoming runoff. If the wet detention storage drys between events, it will detain with no release, the majority of runoff generated by the site for most events. The sediment basin should be equally effective if the wet detention storage drys between events or remains a permanent pool.

The dry portion of the detention storage is drained by an outlet structure and temporarily stores runoff for a sufficient period of time to allow settling of the settleable solids. The Green Book has examples and figures for calculating the required storage to achieve the design detention times and also has illustrations of outlet control devices. For most applications a release rate of 0.06 cfs/acre-inch of runoff should achieve the required detention time of ten hours. The Greenbook recommends using a Curve Number of 90 for sites under construction.

e. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. For construction periods exceeding 1 year, the 1-year sediment load and a sediment removal schedule may be substituted.

e. The required sediment storage volume may be calculated using the Universal Soil Loss Equation or from Figure 6-20 in the Green Book.

503.2 Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed to withstand the expected flow velocity from the 10-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards: a. For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the ***channel (unless a continuous flow of water is present).*** b. For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel. c. For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied, or the grade shall be effectively reduced using drop structures.	**503.2** Conveyance channels, because of the presence of concentrated flows typically having high velocities, warrant special consideration. The slope categories and recommended control measures presented here are derived from language in the Kane County, Illinois draft ordinance. Diversion channels, which are intended to route off-site flows away from disturbed areas, should be constructed as soon as possible in the construction process.
503.3 Disturbed areas shall be stabilized with temporary or permanent measures within 7 calendar days following the end of active disturbance, or redisturbance, consistent with the following criteria, ***weather conditions permitting.*** a. Appropriate temporary or permanent stabilization measures shall include seeding, mulching, sodding, and/or non-vegetative measures. b. Areas having slopes greater than ~~12~~ ***25*** percent shall be stabilized with sod, mat or blanket in combination with seeding, or equivalent.	**503.3** Early stabilization of disturbed areas is essential. USEPA guidance for the permitting of construction activities requires vegetative stabilization within 7 days. The Green Book recommends stabilization within 15 days. b. This provision recognizes the fact that steep slopes generally cannot be effectively stabilized with seeding and mulching alone. Slope instability and high runoff velocities necessitate the use of more substantial measures. The reference to a maximum slope of 12 percent, based on a Kane County 20 criterion, is subject to local discretion and soil conditions. Other ordinances refer to slopes as steep as 33 percent as needing special measures.
503.4 Land disturbance activities in stream channels ***with permanent or semi-permanent flow*** shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met: a. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel. b. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be restabilized within 48 hours after channel disturbance is completed, interrupted, or stopped. c. Whenever channel relocation is necessary, the new channel shall, ***where possible,*** be constructed in the dry and fully stabilized before flow is diverted.	*(see definitions)*
503.5	**503.5**

Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.	Protection of storm sewer inlets should be implemented in a manner which will avoid unacceptable flooding of public streets.
503.6 Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately on the downslope side of the piles.	
503.7 If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent.	
503.8 Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday. ~~and transported to a controlled sediment disposal area~~. ***Any tracked material causing a hazard on a public or private road shall be removed (as defined above) immediately.***	
503.9 All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.	
503.10 All temporary erosion and sediment control measures shall be disposed of within 30 days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures should be permanently stabilized to prevent further erosion and sedimentation.	
504.0 Handbooks Adopted by Reference	**504.0 Handbooks Adopted by Reference**
The standards and specifications contained in ***latest editions of*** *Standards and Specifications for Soil Erosion and Sediment Control* (the Yellow Book, ***issued by the Illinois Environmental Protection Agency,) or as superceded by the Illinois Urban Manual (the Blue Book, developed and issued by the United States Department of Agriculture Natural Resources Conservation Service and the Illinois Environmental Protection Agency***, and the *Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control* (the Green Book, ***issued by the Association of Illinois Soil and Water Conservation Districts***) cited in Section 400.0, are hereby incorporated into this Section 500.0 and made a part hereof by reference for the purpose of delineating procedures and methods of operation under site development and erosion and sedimentation control plans approved under Section 400.0. In the event of conflict between provisions of said manuals and of this ordinance,	As previously indicated, there are certain inconsistencies between this ordinance and the manuals adopted by reference. For example, Paragraph 503.1 specifies design criteria for the sizing of sediment traps and basins. These criteria are similar to, but more explicit than, the Green Book. However, **the Yellow Book specifies radically different criteria for the sizing of sediment traps and basins**. In these cases, this ordinance governs. Nonetheless, the two references can be valuable in the development of the erosion and sediment control plan and in the design and implementation of erosion and sediment control measures. In particular, the Yellow Book provides design specifications not provided by either the Ordinance or the Green Book.

the ordinance shall govern.	

505.0 Maintenance of Control Measures	505.0 Maintenance of Control Measures
All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant (owner or developer) ~~or subsequent landowner~~ during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. ***If a change in owner or developer occurs during the period of land disturbance and development of the site, the subsequent or successor owner or developer shall be required to obtain a new erosion control permit.***	Effective maintenance of control measures is critical to their success and should be budgeted into the erosion and sediment control plan. Particular emphasis should be placed on the following types of maintenance needs: repair and replacement of sediment barriers, such as straw bales; removal of excess accumulated sediment from traps, basins, and channels; irrigation, fertilization, or reseeding of vegetatively stabilized areas; repair of scour or gully development on slopes and in channels; removal of sediment from roadways; and control of dust.
506.0 Inspection	**506.0 Inspection**
1. The (permitting authority) shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sedimentation control plan as approved. ***Applicant shall maintain and make available upon demand*** plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the (permitting authority) ~~shall be maintained at the site during progress of the work~~. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this Ordinance, the permittee shall notify the (permitting authority) within two (2) working days of the completion of the construction stages specified below: a. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading, b. After stripping and clearing ***(if over one acre),*** c. After rough grading ***(if over one acre),*** d. After final grading, e. After seeding and landscaping deadlines ***(if over one acre),*** and f. After final stabilization and landscaping, prior to removal of sediment controls. If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five working days after notice is received by the (permitting authority) from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the (permitting authority). Notification of the results of the	On-site inspections are provided at critical junctures in the development process to assure that development practices and erosion control measures are effective in securing the objectives of the ordinance. Local governments will wish to coordinate this inspection schedule with those required under other permits. In general, inspection should be provided at least monthly, or more frequently in the event of major rainfall events. In some instances (e.g., very small sites), fewer inspections than the six suggested here may be sufficient. Provision is made for development to proceed in the event the local government cannot provide timely inspection, and for inspection at the stage of partial completion in the case of large, phased developments. The phases or areas for which separate inspections will be requested should be identified in the plan. The "Illinois Field Manual for Implementation and Inspection of Erosion and Sediment Control Plans" is an excellent reference for conducting inspections. This manual includes a detailed checklist of inspection criteria and recommends that inspection be performed by a designated site inspector after every storm. USEPA recommends inspection by onsite personnel at least once every 7 days

inspection shall be given in writing ~~at the site~~.	

507.0 Special Precautions	507.0 Special Precautions
507.1 If at any stage of the grading of any development site the (permitting authority) determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the (permitting authority) may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.	**507.1** Unanticipated (1) site conditions or (2) storm events may require that erosion control measures beyond those provided for in the approved plan be instituted. These should be reasonable in terms of the additional costs or delays they impose on the developer in relationship to the risks incurred by the failure to undertake such measures.
507.2 Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the (permitting authority) may specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.	

508.0 Amendment of Plans	508.0 Amendment of Plans
Major amendments of the site development or erosion and sedimentation control plans shall be submitted to the (permitting authority) and shall be processed and approved or disapproved in the same manner as the original plans. Field modifications of a minor nature may be authorized by the (permitting authority) by written authorization to the permittee. ***The (City, Town, County) Engineer shall be authorized to determine the level of modification.***	Particularly on large or phased developments, changed conditions during development may require changes in the plans on which the permit was based. Whether these are of such magnitude as to require a complete review of the project and the adequacy of erosion control measures is a matter of administrative judgment as to potential costs to the developer and the public.
600.0 Enforcement	**600.0 Enforcement**
601.0 Exceptions	**601.0 Exceptions**
The (board of appeals) may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this ordinance:	Exceptions to the requirements of the ordinance may be granted where such exception would not be contrary to the public welfare and where enforcement of the requirements would work undue hardship on the landowner. The required findings and procedures (including public hearing) are intended to assure that exceptions are granted only after full assessment of their benefits and costs, including any adverse environmental impacts. If it is the local government's practice to permit decisions by the board of appeals to be referred to the principal policy body (county or municipal board or council), provisions for this second appeal should be added to this Section.

601.1 Application for any exception shall be made by a verified petition of the applicant for a site development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the site development permit application. In order for the petition to be granted, it shall be necessary that the (board of appeals) find all of the following facts with respect to the land referred to in the petition: a. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that is impossible or impractical for the applicant to comply with all of the requirements of this ordinance; b. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and c. That the granting of the exception will not be detrimental to the public welfare or injurious to other property in the vicinity of the subject property.	
601.2 Each application for an exception shall be referred to the (permitting authority) for review. The (authority) shall transmit its recommendations to the (board of appeals), which shall review such recommendations prior to granting or denying the exception.	
601.3 The (board of appeals) shall hold a public hearing on each application for exception, within thirty (30) days after receiving application, in the manner provided with respect to appeals. After public hearing, the (board) may approve the site development permit application with the exceptions and conditions it deems necessary or it may disapprove such site development permit application and exception application or it may take such other action as appropriate.	**601.3** If local practice includes the use of a hearing officer who makes a report and recommendation to the board of appeals, this provision may be added here.

602.0 Stop-Work Order; Revocation of Permit	**602.0 Stop-Work Order; Revocation of Permit**
In the event any person holding a site development permit pursuant to this ordinance violates the terms of the permit, or carries on site development in such a manner as to materially adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the (permitting authority) may suspend or revoke the site development permit.	A stop-work order may be issued in the event the requirements of the ordinance are violated. This order is temporary unless confirmed by the body responsible for hearing appeals and exceptions. A local government may wish to specify a maximum term for such a temporary permit (e.g., 30 days), after which action by the appeal body will be necessary for the order to remain in force, rather than referring to the board of appeals' next regular meeting.
602.1 Suspension of a permit shall be by a written stop-work order issued by the (permitting authority) and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled	

meeting of the (board of appeals) at which the conditions of sub-paragraph 602.2 below can be met.	
602.2 No site development permit shall be permanently suspended or revoked until a hearing is held by the (board of appeals). Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state: 1)the grounds for complaint or reasons for suspension or revocation, in clear and concise language; and 2)the time when and place where such hearing will be held. Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the (board of appeals) shall determine whether the permit shall be suspended or revoked.	
603.0 Violations and Penalties	**603.0 Violations and Penalties**
No person shall construct, enlarge, alter, repair, or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than ($500) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.	Financial penalties are provided for conviction of violation of the ordinance. Several referenced ordinances also allow for imprisonment. Depending on local practice, it may be desired to identify in the ordinance the official by whom action against alleged violations will be brought and the procedure to be followed. The amount of the penalty should be related to the local government's overall fine schedule.
604.0 Separability	
The provisions and sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.	

Appendix V- Lake Bloomington Sewage Management Report

CITY OF BLOOMINGTON - LAKE BLOOMINGTON, ILLINOIS

WASTEWATER COLLECTION AND TREATMENT SYSTEM

FACILITY PLAN

December, 2003

ENGINEERS
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City of Bloomington-Lake Bloomington, Illinois
Wastewater Collection and Treatment System
Facility Plan
December, 2003

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1.0 EXECUTIVE SUMMARY

This Facility Plan was prepared by Farnsworth Group, Inc. (FGI) to evaluate options for a wastewater collection and treatment system to serve the Lake Bloomington community. No other Facility Plan has been completed for Lake Bloomington prior to this evaluation. The Facility Plan was prepared under the direction of the City of Bloomington Director of Engineering and Water and is in accordance with the terms of an Agreement with Farnsworth Group, Inc. for Engineering Services. This Facility Plan fulfills basic requirements of the Illinois Department of Commerce Community Development Assistance Program (ICDAP) for a Planning Assistance Grant; the Illinois Environmental Protection Agency (IEPA) for low-interest loan financing; and/or for an un-sewered community grant administered by the IEPA.

No centralized collection and/or treatment system currently exists for the Lake community. Currently, Lake Bloomington residents and businesses are responsible for their own raw waste disposal, and homeowners do this with individually owned and operated septic systems. Most homes are served with septic systems and associated leach fields that seep to soils or sand filters that discharge to surface. Effluent from sand filter systems is discharged to Lake Bloomington. The lack of space and unfavorable soil conditions for septic systems, inadequate septic systems, effluent contributing nutrients to the Lake led to the initiation of this Facility Plan study.

This Facility Plan evaluates various options for a wastewater collection and treatment/transfer system for Lake Bloomington and identifies a suitable collection and treatment option based on a life cycle cost analysis. This plan provides a layout of a sewage collection system for the existing developed areas of Lake Bloomington and its surrounding region. The Facility Plan also includes an engineering evaluation for various wastewater treatment/transfer alternatives. These include: 1) Non-Aerated Lagoon Wastewater Treatment Plant (WWTP); 2) Aerated Lagoon WWTP; 3) Covered Lagoon WWTP; 4) Lagoon with Land Application of Wastewater; 5) Trickling Filter WWTP; 6) Onsite Wastewater Treatment System (Orenco System); and, 7) Transfer of

Lake Bloomington wastewater to the City of Bloomington and ultimately to the Bloomington and Normal Water Reclamation District (BNWRD) treatment facility. In transfer options, pumping to various Town of Normal and/or BNWRD present and future pump stations was also evaluated.

A detailed cost analysis was performed for multiple collection systems as well as wastewater treatment/transfer alternatives. The cost estimates for the Lake Bloomington collection and treatment/transfer system include planning/engineering, construction, bidding and construction observation, contingency as well as annual operational, maintenance, and replacement (OM&R) costs. These cost estimates do not include legal costs or costs for acquisition of sewer easements, ROW, etc. These costs are considered adequate for planning and budgetary purposes.

Overall, the most cost-effective collection and treatment alternative was found to be a pressure sewer collection system and an aerated lagoon WWTP at the identified site location. The second cost-effective alternative is the covered lagoon system with pressure collection system; smaller footprint when judged against the aerated lagoon system makes this option attractive. The City of Bloomington has currently no treatment system, and the City is entering into a new area of wastewater treatment, which may prohibit treatment option for Lake Bloomington residents.

For the wastewater collection and transfer options, the least-cost alternative is to pump Lake Bloomington wastewater from the East Pump Station to the BNWRD Future Six-Mile Creek Pump Station in conjunction with the City of Lexington. However, for the City of Lexington, transferring wastewater to BNWRD may not be cost effective; or Lexington may possibly plan to build its own WWTP.

The second cost-effective wastewater collection and transfer option for Lake Bloomington is to pump the Lake's wastewater from West Pump Station to the BNWRD future Six-Mile Creek Pump Station. See Figure 8. Overall, among all the wastewater transfer options evaluated in this report, this is the recommended option for Lake

Bloomington. If the City of Bloomington selects the transfer option, then the City needs to plan and coordinate planning details with BNWRD.

The total capital cost estimate for the aerated lagoon WWTP alternative, including a pressure collection system for the Lake Bloomington Area, is $9,786,000. See Tables 22 and 24. If the entire project is financed with an IEPA low-interest loan over a 20-year period at 2.5% interest rate, the average annual cost for construction as well as Operation, Maintenance and Replacement (OM&R) of the treatment system is estimated at $627,744 and $106,921, respectively, with a combined total of $734,665/yr. Based on an average of 400 users (homes/businesses) and an average customer usage of 5,000 gallons/month, an average user charge for the sewer system would be $153.06/month. This represents a worst-case scenario without any grant or funding assistance. Assuming 50% of the capital cost is funded with grants or other resources and the remaining 50% financed with a low-interest IEPA loan, the total average annual cost is estimated to be $420,793. Here, an individual lake resident would pay an average user charge of $87.67/month/user.

The capital cost estimate for a wastewater collection and transfer (pumping with long forcemain) system to the BNWRD future Six-Mile Creek Pump Station is $10,931,000. See Tables 23 and 26. Again, with an IEPA low-interest loan over a 20-year period, the average annual cost for construction as well as OM&R is estimated at $806,993. In addition to these annual costs for new facilities, a treatment charge per user of $4.35 per month would be assessed by BNWRD. Overall, for this option, an average per user charge is calculated as $172.47/month. Again, this represents a worst case scenario without any grant assistance. Assuming 50% of the capital cost is funded with grants and the remaining cost is financed with a low-interest IEPA loan, the total average annual cost is estimated to be $456,397. Here, the $4.35/month BNWRD treatment charge results in an average user charge of $99.43/month/user.

A preliminary plan for implementing the recommended construction is discussed in Section 9 of this report. Assuming the City of Bloomington approves the Facility Plan and continues to progress toward implementing the project without any significant delays, it appears that the wastewater collection and treatment system could be constructed and ready for operation within three to four years after this Facility Plan is approved by the IEPA.

It is recommended that the City of Bloomington set up a meeting with the IEPA to review selected wastewater collection and treatment options as well as the schedule for Lake Bloomington. This report briefly addresses a number of financing options, however, it is also recommended that the City evaluate in more detail how the cost would be financed and distributed.

2.0 INTRODUCTION

2.1 Study Purpose, Scope and Report Content

This Facility Plan has been prepared to determine the feasible wastewater collection and treatment system for the Lake Bloomington community and surrounding area. This Facility Plan fulfills the basic requirements of the Illinois Department of Commerce Community Development Assistance Program (ICDAP) for a Planning Assistance Grant; the Illinois Environmental Protection Agency (IEPA) for low-interest loan financing; and/or for an un-sewered community grant administered by the IEPA for a wastewater collection and treatment system. A Facility Plan has never been completed for this area. The lack of space and unfavorable soil conditions for private wastewater disposal systems, septic system effluent contributing nutrients to the Lake and the need for centralized wastewater collection/treatment has led to the initiation of this Facility Plan.

This Facility Plan outlines options available to the City to satisfy federal and state regulations for wastewater collection, treatment and discharge. This Facility Plan estimates existing population and growth surrounding the Lake and adjacent areas and provides associated design wastewater flows over a 20-year design period.

This Facility Plan evaluates various options for a wastewater collection and treatment/transfer system for Lake Bloomington and identifies a suitable collection with a treatment or transfer option based on a life cycle cost analysis. This plan provides a layout of three sewage collection system alternatives for the existing developed areas of Lake Bloomington and its surrounding region. The Facility Plan includes an engineering evaluation of the following wastewater treatment/transfer alternatives: 1) Non-Aerated Lagoon Wastewater Treatment Plant (WWTP); 2) Aerated Lagoon WWTP; 3) Covered Lagoon WWTP; 4) Lagoon with Land Application of Wastewater; 5) Trickling Filter WWTP; 6) Onsite Wastewater Treatment System (Orenco System); and, 7) Several options of transfer (pumping) of Lake Bloomington wastewater to the City of Bloomington and ultimately to the Bloomington and Normal Water Reclamation District

(BNWRD) treatment facility. The plan also identifies a suitable site for a wastewater treatment plant or transfer (pumping) station.

A detailed cost analysis, with capital cost as well as operational, maintenance and replacement (OM&R), was performed for multiple collection systems as well as wastewater treatment/transfer alternatives. Total annual cost and per user charges are calculated to determine the recommended treatment and/or transfer alternative. User rates are calculated based on project financing with a repayment for an IEPA low-interest loan (at 2.5% rate) over a 20-year period. A preliminary implementation schedule is also provided for the recommended alternative. In accordance with IEPA requirements, direct and secondary environmental impacts and various loan/grant options available to the City of Bloomington have also been discussed.

2.2 Existing System Description

Lake Bloomington is approximately eight miles north/northeast of the Town of Normal and seven miles west of the City of Lexington. The Lake is located in McLean County, which lies in the central part of the State of Illinois, along Illinois Route 8, west of Illinois Route 29 and east of Illinois Route 31.

Lake Bloomington was constructed in the 1930s as a City of Bloomington water supply. It has a surface area of about 572 acres and was formed by construction of a dam on Money Creek, a tributary to the Mackinaw River. The dam is located about one mile south (straight line) of the Mackinaw River and approximately three miles upstream of the Money Creek and Mackinaw River Confluence. To maintain its water volume, the Lake depends on water from two tributaries (Money and Hickory Creeks) and on rainwater. Figure 1 shows an aerial photography of Lake Bloomington and the surrounding Area, the aerial photo was taken in April 2001.

Existing development surrounding the Lake consists primarily of residential with a few commercial establishments. Most Lake residents work in the City of Bloomington and

Town of Normal. Some of the main commercial establishments within this Lake community include the City of Bloomington Water Treatment Plant, two restaurants, Davis Lodge (Conference Hall), and another small lodge. The developed area is surrounded by agricultural land. There is an established Nature Preserve along the Mackinaw River. Future development is expected with some being light commercial but most being residential. In the last two decades, demand for residential housing around the Lake has increased substantially. The City of Bloomington owns all lands adjacent to the lakeshore and leases lots with 99-year leases to homeowners. Originally, homes were summer cottages but most have been remodeled to permanent homes. The Lake's shore is almost fully occupied except for the upper (upstream) end. Homes around the Lake are in high demand with some valued in excess of $1 million. Some small sub-divisions away from the lakeshore have been done over the years, and there is pressure to extend this development.

The City of Bloomington provides water service via a publicly owned and operated water treatment plant and distribution system. Water services are metered and customers are charged a rate for water according to usage.

The Lake Bloomington area has no centralized sewer system or wastewater treatment/transfer facility. Each home on the Lake is responsible for its own wastewater treatment. Most homes have individual septic systems, which includes a septic tank discharging into leaching fields, sand filters, existing field tiles, cisterns, and/or in a few instances directly into Lake Bloomington. All septic systems ultimately discharge effluent to Lake Bloomington either through direct surface discharge or seepage to groundwater that reaches the Lake. Some homes have entire septic systems (septic tank and sand filter/leach field) on their property. A number of homes, which are built close together and/or have relatively small lots, have a septic tank on the property but have a leaching field or sand filter on adjoining City-owned property.

The McLean County Environmental Health Department keeps a comprehensive record of location, condition and number of septic systems in the County, including Lake

Bloomington and the surrounding area. According to the information provided by the Health Department, there are 344 permitted and operational septic systems surrounding Lake Bloomington. Out of these 344 active septic systems, only 105 were installed or repaired in the 1990's with the others being older than 13 years. See Table 1 for a summary of septic systems installation or repair information for the last five decades. More detailed data regarding various septic systems types, conditions and other related information are available upon request.

The City of Bloomington requires individual homeowners to do a thorough inspection and if need be, install a new septic system at the time of property resale. The need for centralized wastewater collection and treatment is realized because soil conditions are unfavorable for construction of properly functioning on-site systems. In most cases, large seepage bed areas are required because of tight soils, and existing home sites are too small. On sites that do not support soil adsorption systems, sand filters with direct surface discharges are required. Similarly, in quite a few instances, expansion capacity of existing homes is limited because a sufficient area is not available for appropriately sizing a leach field or sand filter.

During dry weather conditions, septic systems (a properly functioning septic tank with sand filter or seepage bed) will provide an equivalent of secondary treatment for domestic wastewater. In wet weather with saturated ground conditions, only primary treatment may be expected. The existing conditions necessitate action for centralized wastewater collection and a treatment system. The continued use of failing septic systems, improper or no treatment and use of Lake Bloomington for wastewater discharge from individual septic systems is not an acceptable long-term solution to support existing homes and businesses or to provide for growth.

3.0 WASTEWATER DISPOSAL OPTIONS

3.1 Effluent Discharge to Surface Waters

In order to prevent the degradation of federal and state surface waters, effluent discharge limits for all wastewater treatment facilities are regulated under National Pollutant Discharge Elimination System (NPDES) permits. The effluent discharge standards depend on the point of discharge of the treated water. Typically, any discharge to 'general purpose' streams can normally contain no more than 10 mg/l of Biochemical Oxygen Demand (BOD) and 12 mg/l of Suspended Solids (SS). Any new treatment facility is also required to meet effluent discharge limits for ammonia; a typical ammonia limits are 1.5 mg/l in summer and 4.0 mg/l in winter, respectively. These effluent standards have been set to prevent accumulations of excessive sludge deposits in streams and to maintain dissolved oxygen, which will be suitable for fish and other aquatic life in the stream.

As mentioned earlier, Lake Bloomington was established by construction of dam on Money Creek. Money Creek, an un-named small tributary to Money Creek, and Big Slough Creek, all discharge to Lake Bloomington. All streams are classified as intermittent, which means that they have no natural flow during dry weather periods. Lake Bloomington overflow is also Money Creek, which discharges to the Mackinaw River about three miles downstream from the dam.

The Mackinaw River, upstream from the Money Creek confluence, is classified as General Use Waters and is rated as a Class A stream under the Agency's Biological Stream Characterization (BSC) program. Mackinaw River upstream of Money Creek is also found on the Draft list of Impaired Waters in Illinois (Illinois Draft 2002 Section 303(d) list), which defines this segment as impaired. The cause of impairment is identified as PCBs. The source associated with the impairment is classified as "unknown" by the IEPA. It would be more difficult to get a NPDES permit for effluent discharge in the Mackinaw River, upstream of Money Creek. Preliminary discussion with IEPA revealed that for any new discharge to the Mackinaw River upstream of Money Creek, the permittee would be required to prove that a new discharge would not impact the receiving stream and/or Mackinaw River.

Lake Bloomington is also classified as General Use Water, but is not rated under the Agency's BSC program. Like the Mackinaw River, one segment of Lake Bloomington is also found on the Illinois Draft 2002 Section 303(d) list. The cause of impairment given for the segment is excessive algal growth/chlorophyll, nutrients, phosphorus, nitrogen (ammonia-N) and nitrates. The sources associated with the impairment are agriculture; crop related sources, non-irrigated crop production, construction, land development, and herbicide/algicide application. Consequently, in addition to ammonia limits, phosphorus limits would be considered for a discharge to any tributary of Lake Bloomington.

According to the IEPA, Money Creek upstream and downstream from Lake Bloomington is classified as General Use Water and is rated as a Class C stream under the Agency's BSC program. The Illinois Natural History Survey (1992 publication, which lists Biologically Significant Illinois Streams) does not list Money Creek as a biologically significant stream nor does it indicate a presence of any threatened or endangered species of aquatic life.

Based on preliminary discussions with the IEPA, the discharge to Money Creek downstream of the Lake or its unnamed tributary in the northwest corner of the Lake would be the preferred location for any Lake Bloomington treatment works effluent discharge. The discharge location is shown in Figure 1. Overall, any discharge to a non-rated, non-listed unnamed tributary would be an easier candidate for attaining the NPDES Permit. It is also clear from discussion with IEPA that the discharge from a treatment facility would have to meet rigorous standards for nutrients as well as organic content, especially for any discharge to Lake Bloomington or associated tributaries to Lake Bloomington. A written request was made of the IEPA for preliminary determinative of treatment facility effluent standards. See Appendix B. The following is a summary of expected effluent standards:

Parameter	***Concentration Limits***		
	Daily Maximum	Monthly Average	Weekly Average
$CBOD_5$	20	10	
Suspended Solids (mg/l)	24	12	
Ammonia-Nitrogen (mg/l)			
Spring/Fall	6.8	1.7	4.3
Summer	12.1 (4.8)*	1.9 (1.5)*	4.8
Winter	8.6 (7.2)*	4.0 (2.0)*	N/A
pH	6 to 9 Standard Units		
Total Residual Chlorine (mg/l)	0.05**	--	
Fecal Coliform	400**	--	

The Agency also indicated that the effluent discharge to the Money Creek tributary might be eligible for a year-round disinfection exemption.

The final determination of effluent standards will be made by the IEPA when the City makes an application for an NPDES permit for the new discharge. This application process normally requires extensive agency review and public hearings. The agency considers not only established effluent and stream standards (as indicated above) but also a relatively new policy, which prohibits degradation of the existing stream conditions. This could result in site-specific standards that are more restrictive than those shown above.

3.2 Land Application of Wastewater

Irrigation of agricultural crops is another effective way to dispose of treated wastewater. However, wastewater disposal to farmland for irrigation of crops is a seasonal activity, and thus, discharge from the treatment plant is limited to the spring and summer months. As a result, wastewater flows generated during the non-irrigation months need storage in lagoons until the irrigation is possible.

* Ammonia Nitrogen values in brackets were given initially by IEPA in September 2002. IEPA revised and issued new preliminary ammonia nitrogen limits based on three season criteria in March 2003. See Appendix B.

** The discharge may be eligible for a year-round disinfection exemption.

Typically, a land application site is sized to accept one year of flow in seven months, and the storage is sized to hold five months of wastewater flow. Application criteria are set to protect the groundwater, maintaining its drinking water quality. Monitoring of wastewater discharges and groundwater would be required with the land application system. The land application site must have enough percolation or seepage capacity to accept the irrigation water without ponding. Additionally, land application may only be conducted on fields producing crops that are not used for direct human consumption.

4.0 BASIS OF DESIGN

4.1 Study (Service) Area

Lake Bloomington is located in Sections 1, 12, and 13 of T25N, R2E (Hudson Township); and Sections 6, 7 and 18 of T25N, R3E (Money Creek Township). For this planning study only, these sections are considered. If the City decides to proceed with plans for construction of a collection system and wastewater treatment/transfer system, the Illinois Water Quality Management Plan (IWQMP) needs to be amended for Lake Bloomington. The current study area of Lake Bloomington would need to be developed into either a separate or sub Facility Planning Area (FPA) from the City of Bloomington FPA. See Figure 1.

4.2 Population Projections

There is no direct census data available for the Lake Bloomington community. The City of Bloomington, however, keeps a record of all the existing registered homes with an official mail address (residential or domestic units). In order to estimate the current and future populations, these existing registered homes were counted and used for the described study area. A residential/domestic unit is a standard usage criterion that estimates wastewater flow generated by a typical residential home in a 24-hour period. Based on the present count of all the registered existing homes in the study area and using a constant growth rate per year, the future number of residential homes and the population surrounding the Lake were estimated. See Table 2.

Existing development surrounding the Lake consists primarily of residential, with very few commercial establishments. Potential growth surrounding the Lake is projected to be a mix of light commercial and residential, with residential being a larger portion. As mentioned earlier, in the last two decades the demand for residential housing around the Lake has increased. In the absence of a centralized wastewater collection and treatment system, the City of Bloomington was forced to maintain limits on residential growth surrounding the Lake. According to the City of Bloomington Director, the number of homes has not changed in the last 40 to 50 years. However, most of the seasonal small homes and cottages have changed to relatively upscale and large permanent homes.

With the potential future addition of a municipal sewage collection and treatment system, the Lake will offer full utility service to its residents; hence, the Lake population growth at a higher rate may be expected. Similarly, the wooded scenic topography around the Lake, the upscale homes, and the remote location with modest proximity to Bloomington and Normal makes this area attractive for growth. Keeping future growth prospects in mind, population projections with an increased growth rate (2.0% per year) have been completed for a 20-year design period. It should be noted that on an average this growth rate was also observed over the last two decades for the City of Bloomington. Table 2 provides an estimation of the present and projected future number of homes as well as the population at Lake Bloomington. Population estimates were reviewed with the City of Bloomington and the City concurs with the estimates.

A summary of population projections prepared for purposes of facility planning and completed for a 20-year design period is given below:

1.	Existing Homes:	400 Houses
2.	Existing Population (3.5 PE Per House):	1400 persons
3.	Future Homes by Design Year 2025:	586 Houses
4.	Future Population by Design Year 2025:	2050 persons

Hence, a design estimate for the **design year 2025 population is 2050 persons.**

Since no sizeable commercial and/or industrial facility exists within the Lake Community, no separate population projection from commercial and/or industrial areas were estimated to arrive at the design population for the wastewater collection and treatment system. The projected service population represents both the residential and commercial populations within the Lake for the specified design period.

4.3 Design Flows and Loading

Wastewater flow and loading are estimated from the number of housing units (residential/domestic) in the study area. The flow of 350 gallons per day per residential/domestic unit is used to estimate system requirements.

Design Year 2025 Houses:	586
Design Year 2025 Population Equivalent:	2050 PE
Design Average Flow (DAF):	0.205 MGD (205,000 gpd)
Design Maximum Flow (DMF):	0.82 MGD (820,000 gpd)
Ratio of DMF/DAF:	4.0
Design BOD loading:	451 lbs./day
Design SS Loading:	513 lbs./day

Based on a design population equivalent of 2050 persons and an average per capita water use of 100 gal/day, the design year 2025 wastewater collection system will be sized for a design average flow of 205,000 gpd (0.205 MGD) and design maximum flow (peak) of 820,000 gpd (0.82 MGD). The wastewater treatment facility will be sized for a design average flow of 205,000-gpd (0.205 MGD) and design maximum flow (peak) of 820,000 gpd (0.82 MGD).

Organic loading is calculated based on the Illinois Recommended Standards for Sewage Works at 0.22 pounds of BOD and 0.25 pounds of suspended solids per capita per day.

5.0 SEWAGE COLLECTION SYSTEM

5.1 General Description

Several alternatives exist for a centralized waste collection system. A conventional gravity-type system; a small diameter gravity type system used in conjunction with septic tanks; a vacuum sewer system; a pressure sewer system; Septic Tank Effluent Pump (S.T.E.P.) system; and, a combination gravity/pressure system are the alternatives considered in this report. A brief overview of various collection system types is given below:

5.1.1 Conventional Gravity System

A conventional gravity system would consist of 8-inch diameter or larger gravity sewers with manholes placed at pipe junctions and at appropriate intervals (maximum 400 ft.) to facilitate maintenance and repairs of the sewer mains. The wastewater flows under gravity (from high to low points) from all homes and businesses to the treatment site or pumping station(s). The sewer pipe is laid maintaining a slope (e.g. for 8-inch sewer, minimum slope is 0.40% or 4.0 ft of fall in 1,000 ft of pipe length) that will allow a scouring velocity of a minimum 2.0 ft/sec to keep the sewers free from solids. The major advantages of the conventional gravity system include its low operation and maintenance costs, it's proven reliability, and extensive use in the domestic wastewater collection systems. A gravity system can also handle large variations in flow and is more readily adaptive for growth and change within the community. The disadvantage associated with a gravity system for Lake Bloomington is the cost of construction (deep construction, construction below the water table with higher dewatering costs) and the need for several lift stations to transport wastewater around the Lake. Lake Bloomington surrounding topography does not allow the construction of a conventional gravity system without numerous pumping stations and major disruptions, hence, this system was not considered for the Lake community.

5.1.2 Small Diameter Gravity System

The overall system layout is the same as the conventional gravity sewer alternative. However, this system involves construction of gravity sewers utilizing smaller diameter pipes than those normally used in a conventional gravity system. This small diameter sewer system requires the use of septic tanks to provide primary settling or treatment of wastewater solids and a regular maintenance program for the septic tanks. The primary effluent from the septic tanks is collected and conveyed through small gravity sewers to a treatment plant for further treatment.

This system would be laid with 4- or 6-inch diameter sewer pipe and manholes or clean-outs placed at junctions and intervals not to exceed 400 ft. Disadvantages of this system include: obtaining easements from all septic tank owners to allow access for the evaluation, construction and/or repair of the septic tanks; being an uncommonly used collection system; and, higher cost of maintenance (relative to a conventional gravity system). Use of this system is also restricted because of the topography around the Lake and is not recommended for the Lake Bloomington Community.

5.1.3 Vacuum Sewer Collection System

Vacuum systems are mechanized (negative pressure) systems for wastewater transport. Differential air pressure (between the atmospheric pressure and the vacuum in the sewer lines) is the operating principle in a vacuum sewer system. The system consists of vacuum stations, vacuum sewers and valve pits. The major components of a vacuum station include vacuum pumps, collection tank, sewage pumps and control panel. The vacuum sewer system utilizes small 3- to 4-inch diameter vacuum mains to supply vacuum to the interface valves and transport the sewage. The valve pits are located at individual homes or cluster of homes (one valve can serve a maximum of four homes) which collect sewage until a pneumatic valve is triggered to allow the sewage to be vacuumed to a collection tank at the vacuum station. The valves act as the interface between the sewer vacuum and the atmospheric air of the house gravity line. Sewage pumps transfer the sewage from the collection tank to the treatment facility. The wastewater is conveyed to the individual valve (or sump) pits by gravity lines from each home or business.

Advantages of the vacuum system include use of small PVC pipes, no requirements of manholes, installed at a shallow depth thus reducing excavating and construction costs, and no need for electrical power at the valve pits. Disadvantages to the vacuum collection system include higher operational, maintenance and replacement (OM&R) costs, lack of suppliers, unpopular collection system, the need for valve pits in strategic locations, the initial equipment and services associated with equipping each pit for proper operation, and specialized equipment requirements for the vacuum station.

5.1.4 Pressure Sewer System

A pressure sewer system is a collection system that uses pumps and small diameter forcemains for wastewater transport. The two major types of pressure systems are the grinder pump (GP) and the septic tank effluent pump (STEP) systems. In the GP pressure system, a grinder pump station is installed at the individual homeowner's property, and sewage from each home is transported to these stations by gravity. The sewage is pumped from home grinder stations by a grinder pump, which grinds solids and pump sewage under pressure to municipal sewers or a centralized treatment system. The pressure sewer system lines do not rely on gravity, hence, the system can be installed economically whether the site is flat, wet, hilly, rocky or sandy, allowing flexibility in land planning. A pressure sewer system is easier to install than a conventional gravity sewer system and is relatively economical in terms of capital costs. Forcemains do not need to be located as deep as gravity sewers, requiring only being under the frost line. They can be installed using directional drilling, which reduces site restoration associated with the open-cut method. The disadvantages of a pressure system include higher maintenance costs and limited expansion capability.

The lack of natural slope and topography around the Lake lends itself to a pressure sewer system. A preliminary cost estimate for the pressure sewer system was prepared with PVC pipe for direct burial and high-density polyethylene (HDPE) pipe for directional drilling.

5.1.5 Septic Tank Effluent Pump (S.T.E.P.) System

This system, in principle, utilizes the pressure sewer system in conjunction with septic tanks. This system would include septic tanks equipped with pumps located at individual homes or groups of homes as allowed by the development to transport the liquid wastes to the centralized treatment site for treatment. The STEP system accompanied by the centralized treatment system eliminates the need for individual drain fields and/or sand filters. Here, this STEP system is considered in conjunction with Orenco Recirculating Sand Filter, which will be discussed later in the report.

A main disadvantage of the STEP system is that it only addresses the liquid portion of wastewater and still requires regular (routine) septic tank maintenance. Another disadvantage is the increased operation and maintenance costs associated with the numerous septic tanks as well as pump installations in the system. Easements would also have to be obtained from all customers to allow for construction, inspection, repair, and maintenance, as well as access to the septic tanks. It should be noted that less than one-third of all currently operated septic systems at Lake Bloomington were built or inspected in last 12 to 13 years. Hence, either new construction of septic tanks or a thorough evaluation of all existing septic tanks with a few new constructions will be necessary for this system.

5.1.6 Combination Gravity Sewers / Pressure Forcemain System

A combination gravity/pressure system would use the advantages of both the gravity sewer and pressure forcemain systems. A preliminary investigation revealed that the topography around most of Lake Bloomington does not allow the construction of a conventional gravity system. However, this project may benefit from using gravity sewers in an existing subdivision (Hickory Hillside Subdivision on the west of the Lake) while installing a pressure system for the remaining Lake Bloomington areas. Wherever possible, a gravity sewer system will be used coupled with a pressure collection system. Hence, this combination gravity sewers/pressure system is not completely ruled out.

5.2 Collection System Layout, Cost Estimates and Recommendations

Preliminary layouts and cost estimates were prepared for both the vacuum and pressure sewer collection systems. In addition, cost estimates are also provided for the STEP sewer system. Essentially, the STEP sewer system layout will be the same as the pressure sewer system. The collection system layout is provided to serve only the existing and developed parts of Lake Bloomington. For treatment alternatives, the sewer layout is based on a premise that sewage will be collected and transported to the proposed wastewater treatment site. For wastewater transfer options to BNWRD, it is assumed that initially the Lake's wastewater would be collected and discharge to a main pump station. A discussion on treatment and/or transfer alternatives is provided in Section 7 of this report.

Both pressure and vacuum systems are recognized in the USEPA publication number EPA/625/1-91/024 - Manual for Alternative Wastewater Collection Systems. These collection systems would be planned and designed according to the Illinois Recommended Standards for Sewage Works.

The vacuum system around the Lake includes 59,500 feet of 4-inch to 8-inch vacuum main, 25,400 feet of forcemain, 40,000 feet of 3-inch discharge piping with 210 valve pits (most valve pits would serve two residential properties) installed on private property, and three vacuum stations. This vacuum system will serve 378 existing homes surrounding the Lake. Twenty-two homes south of the Lake are beyond the reach of the vacuum collection system. The initial collection system and vacuum stations would be sized to have capacity for the identified future growth. Some upgrade would be needed for Vacuum Stations 2 and 3 as more homes are connected to those stations. A layout for the vacuum collection system is shown in Figure 2. A cost estimate for the vacuum collection system is identified in Table 3.

A preliminary plan for the overall pressure collection system is shown in Figure 3. Two cost estimates are prepared for the sewer collection system; one with high-density polyethylene (HDPE) and a second with PVC pipe. The cost estimates for the pressure collection system are identified in Tables 4 and 5, and are based on a collection system surrounding the entire existing Lake community. The pressure system around the Lake would consist of 113,000 feet of 1-1/2-inch to 10-inch forcemain, 40,000 feet of 1-1/4-inch to 2-inch pressurized discharge piping and 400 grinder pumps. The entire system was planned to ensure that proper velocities were maintained and that no point in the system exceeded the maximum recommended pressure. The total dynamic head (TDH) for various pumps is based upon pipe sizes, the number of pumps, and elevations of pipe mains and grinder pumps.

It should be noted that currently, this pressure system is laid out to serve almost the entire community around the Lake. However, should the City decide not to serve the less populated area in the southern (upstream) part of the Lake, approximately 21,000 feet of 1½-inch to 3-inch pressure sewer main, 2,200 of discharge piping, 22 grinder pumps, and related ancillaries could be removed from the estimate.

Gravity sewers may be used for the Hickory Hillside Subdivision, with the possibility of a few grinder pump stations required for homes in low-lying areas. An 8-inch gravity sewer will serve most of the area. Some homes may require individual grinder pumps, or one common grinder pump station could serve multiple homes in one low-lying area. Sewers within the subdivision area will flow to the regional pump station site from where the wastewater will be pumped to the treatment site on the northwest side of the Lake. However, for preliminary planning purposes, a vacuum or pressure collection system is also used for these areas.

The preliminary sewer layout is representative of the total sewer piping required, but the locations of individual pipes would be adjusted during design to minimize property impact and utility conflicts. Similarly, sizes of various segments would be adjusted during the design phase, when complete topographic information would be available. Typically the grinder pump station for the pressure system or valve pit for the vacuum system can be located near the existing septic tank, making the plumbing of an existing residential house sewer to the pump or valve pit more efficient. See Figure 4.

A total cost estimate for construction of the sewage collection system includes engineering and construction contingency as well as bidding and construction observation costs. This cost estimate does not include legal costs nor does it include costs for acquisition of sewer easements, ROW, etc. Cost estimates do include costs associated with disconnecting and abandoning the individual septic tanks and service connections to the new sewer system.

Cost estimates include the cost of furnishing sewers to existing homes within the Lake Community in a single project. Actual construction of the sewer system may be performed in phases, as specific areas of the Lake are required to connect to the collection system. Initial phases of construction could provide sewers to those areas in which existing septic systems have failed or require upgrade. Subsequent phases of the collection system could be constructed at such time as other areas require upgrade of their septic systems, or as newer developments originate within or around the Lake. Phasing would reduce the initial cost of the project, but may result in increased sewer-user rates due to the decreased number of service connections.

A layout of the sewage collection system to serve currently undeveloped areas has not been provided. The system would be extended when those areas are developed.

When comparing cost estimates for the vacuum and pressure sewer collection system, it appears that the pressure sewer system would be a more feasible collection system for the

Lake Bloomington and surrounding area. The vacuum system does not appear to be a cost effective alternative for Lake Bloomington residents and hence is not recommended.

5.3 Service Connections

Service connections or lines, generally on private property, are those lines from a house, commercial establishment, or industry, which transport wastewater from a building to the municipal sewer collection system. Service connections are also referred to as building sewers, house sanitary connections, or lateral connections. These lines are typically installed on a 1% to 2% grade using 4-inch to 6-inch pipe. One percent grade is considered as minimum grade for house connections.

There are two ways to provide for service connections. One is that property owner hires a plumber to do the service connection as well as cleaning and abandonment of the septic tank. Second is that an authoritative body provides the service connection to the premises at a cost to the property owner.

In case of gravity sewers, the sewer system installation generally ends at each homeowner property line. Wyes or tees are installed in gravity sewers and are the preferred method for connecting individual property owner. It is then the responsibility of the property owner to hire qualified plumbers to connect into service pipe (off of the public gravity sewer line) at the property line. Typically, the cost of an individual service connection ranges from $500 to $1,500, depending on the distance to the main sewer.

In the case of a pressure or vacuum system, the system installed will essentially end at the individual grinder pump station or valve pit located between the existing septic tank and the house. See Figure 4. However, the costs of connecting to the grinder pump station or valve pit and the cleaning and abandonment of the existing septic tanks are included in the overall cost estimate for the Lake Bloomington sewer collection system. The City of Bloomington would then provide the service connection to the individual houses at a cost to the property owner, which is already included in the overall costs for the collection system.

The City of Bloomington may also consider passing an ordinance for the Lake community to ensure full participation from all the residents surrounding the Lake. The ordinance would state that when a public sewage collection system becomes available in a street, alley or thoroughfare to a building, the sanitary or domestic sewage from any plumbing system in said building would be discharged into the public system within a defined period of time.

5.4 Public Sewer Connection Charge and Monthly User Charge

A public sewer connection charge is a one-time charge to a property owner for connecting to any publicly owned sewer collection and treatment system. The City (an authoritative body) may require a connection charge from each individual homeowner for connecting to a publicly owned sewer system and for using up the capacity of sewer as well as the wastewater treatment facility. Typically, a connection charge is imposed for the purpose of financing a portion of the costs associated with the construction of the system and to recover funds to finance capital improvement project related to the user portion of the collection and treatment system capacity. The one-time connection charge is in addition to a monthly user charge.

For example, currently per the BNWRD sewer ordinance, a connection charge is $1,400 per customer. The City of Streator requires a connection charge of $1,500 per user. The City of Pontiac requires a minimum connection charge of $25 per user. However, the City of Pontiac charges a maximum of $1,500 for a single-family residential house depending on the location of the house and/or the amount of the sewer extension paid for by the City. The City of Bloomington one-time connection charge varies from $400/acre to $3,000/acre.

A monthly user charge (fee) is a wastewater service charge for the use of and for services supplied by the wastewater facilities. It consists of a volumetric charge (based on water usage) for operational maintenance, and replacement (OM&R), applicable surcharges, and a local capital cost fee composed of a debt service charge and a capital improvement charge. The portion of a monthly (wastewater service) charge applied to debt service may be reduced for an individual user, if a large connection charge is required at the time of connection to the public sewer system. The City of Bloomington's current monthly user charge for wastewater is $4.50, based on an average monthly water usage of 5,000 gallons.

The City may consider having a higher public sewer connection charge for the Lake Bloomington community to offset initial costs, since it is also providing for service connections to individual homeowners, which is usually a separate expense item for homeowners.

6.0 WASTEWATER TREATMENT PLANT (WWTP) SITE LOCATION

6.1 General Description

When determining an appropriate location for a new Wastewater Treatment Plant (WWTP), there are several issues that must be evaluated that will help determine a preferred location to best serve the community. Historically, treatment plants are located at the lowest point of the area to be served. Today, with new environmental concerns, potential growth, etc., the location and evaluation criteria have been adjusted.

The following items represent the criteria for conducting a site evaluation for a proposed Wastewater Treatment Plant:

1. Property issues – Use of the City-owned ground or property economically acquired will eliminate or reduce overall project costs, other considerations being equivalent.

2. Topography – If a site can be chosen at a low elevation, the overall cost of pumping to the proposed WWTP can be reduced, thus reducing construction costs and future operating and maintenance expenses.

3. Access to collection system – The proposed WWTP should be located so as to minimize the construction of gravity trunk sewers to connect into the WWTP, so it can provide maintenance-free service (from a hydraulic perspective) as intended.

4. Access to Roadway – Roadway access is required for maintenance. Locating the proposed WWTP near existing streets or access driveways will help to reduce this cost.

5. Geology – After a suitable site is determined, soil borings need to be conducted to determine existing earth supportive capabilities for different WWTP treatment units. If unsuitable soil conditions are discovered, it may be more cost-effective to select an

alternate site than to spend substantial additional dollars on a sophisticated foundation system and/or trucking of required materials to support the units.

6. Effluent Discharge Location – The WWTP should be located so as to minimize the construction of effluent line to discharge into the nearby stream. Preferably, a WWTP needs to be located near streams, which is not protected nor contain any endangered or protected aquatic species.

7. Aesthetic – This is a "non-engineering" issue, but a consideration that must not be overlooked. Some odors may be associated with a WWTP and for some residents the appearance, odor or proximity to a WWTP may be objectionable for many reasons. Thus, it is desirable to locate a WWTP away from and down wind of residential areas if possible.

8. Other Issues – Unsuitable site conditions or past uses of a given site (such as mining activity, reservoir, etc.) may restrict its future use as a WWTP site.

6.2 Site Description and Layout

Preliminary site selection for the proposed WWTP facility was primarily based on areas near possible discharge locations, accessibility and availability of sites for locating a WWTP. Two potential sites were evaluated: one on the northeast side of the Lake near Illinois Route 8 and a tributary to the Mackinaw River; and a second site near a tributary to Money Creek on the northwest side of the Lake.

Because of the proximity to the effluent discharge location, the site in the northwest corner of the Lake is chosen as the best site for the WWTP. This site is located approximately one-quarter (¼) mile west of the Lake near Illinois Route 8. The general location of the selected site for the proposed WWTP is also delineated in Figure 1. Final site selection will be contingent upon soil borings results, community input and availability of the property.

The advantages of the chosen site include:

1. Remote location;

2. Not in close proximity to any residential development;

3. No current knowledge of any unsuitable site conditions or past uses of the given site;

4. Close proximity to an unnamed tributary discharging to Money Creek and a suitable effluent discharge location. The site also offers long distance travel for the WWTP effluent before it can reach the Mackinaw River.

5. Relatively large area is available to build a WWTP;

6. The site is not prime farmland;

7. The site is not located in a flood plain;

8. The site is not located within a 1000 ft of a water treatment plant and/or drinking water reservoir; and,

9. The property may be available to the City at a reasonable price.

7.0 WASTEWATER TREATMENT OR TRANSFER ALTERNATIVES

This section will review wastewater treatment alternatives that will remove Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia Nitrogen (NH_3-N) from the wastewater to the levels required by regulatory effluent standards. This section will also review wastewater transfer alternatives that would basically transfer the Lake Bloomington's wastewater to the Bloomington and Normal Water Reclamation District (BNWRD) collection system for treatment at the BNWRD West WWTP and/or new Southeast WWTP.

Several alternatives of treatment with disposal and transfer were evaluated for the Lake Bloomington wastewater flow. These alternatives include Non-Aerated Lagoon WWTP, Aerated Lagoon WWTP, Covered Lagoon WWTP, Mechanical (Trickling Filter) WWTP, Land Application of Wastewater, Onsite Treatment System and various options of the Lake's wastewater transfer to BNWRD. Discussion of these treatment/transfer alternatives is presented below.

For the purpose of this report the WWTP would be located on the site in the northwest portion of the Lake as identified in the previous section. Flow would reach the plant via trunk sewers, pump stations and forcemains as necessary.

Any wastewater flow arriving at the WWTP headwork's (influent) will be lifted (pumped) to the primary treatment process to provide the hydraulic gradient (energy) for gravity flow through the remaining treatment processes without additional pumping. An influent pump station (lift station) would be needed irrespective of which site location and/or what treatment alternative is used. The pump station would be designed for a peak flow of 0.82 MGD (570 gpm). A cost estimate for the influent pump station and forcemain is shown in Table 7.

7.1 Non-Aerated (Facultative) Lagoon WWTP

Non-aerated, facultative lagoons, or waste stabilization ponds, are sized on the basis of an anticipated sewage organic loading per acre of lagoon surface area. Operating water depth is around 5 ft. The treatment system consists of primary and secondary lagoon cells with tertiary filtration, and effluent sampling and flow measurement. There are no mechanical components with the exception of valves and the sampling/flow measurement equipment. The main benefit of this type of system is the minimal equipment and maintenance activities required to maintain the WWTP facility. Such a WWTP facility may operate with a lagoon exemption as well as Fecal Coliform Exemption, which means less stringent discharge limits and potentially no effluent chlorination requirement for the WWTP.

Non-aerated lagoon systems require a large site area for the treatment system. According to the IEPA criteria, for Lake Bloomington, at least a 40-acre site is needed to provide the secondary treatment and storage of wastewater.

For the Lake Bloomington wastewater flow, a basis of design for a non-aerated lagoon WWTP was prepared to allow determination of site layout requirements, preliminary sizing and selection, and development of a preliminary cost budget. The 2050-PE (population equivalent) BOD loading controls the design, and the resultant lagoons are sized accordingly. According to IEPA criteria, primary treatment with non-aerated lagoons system requires a minimum of 17.5 acres for the design BOD loading. Overall, primary and secondary treatment includes two primary lagoons of 10 acres each and a secondary lagoon of 5.5 acres. The lagoons are designed for a normal operating depth of 5.0 ft and storage depth of 6.0 ft above the lagoon bottom. These lagoons provide for the 110 days of wastewater storage at design flow. A re-circulation pump station is included to return secondary effluent to the primary lagoon to enhance treatment effectiveness and re-circulate wastewater within the system during low flow and/or high evaporation periods. A preliminary basis of design for a non-aerated lagoon WWTP is given in

Appendix A. Since a chlorination (fecal coliform) exemption can probably be obtained for the WWTP effluent, no facilities are considered in this alternative for disinfection.

A summary of preliminary cost estimates for the non-aerated lagoon WWTP is provided in Table 8. Due to the requirement of two large primary lagoons and possible ammonia discharge limits, the facultative or non-aerated lagoon WWTP is not considered as a feasible option to meet the Lake's WWTP needs.

7.2 Aerated Lagoon WWTP

In concept, aerated lagoons are very similar to non-aerated lagoons, except that the aerated lagoons reduce the surface area of the lagoons by mechanically providing oxygen to the system. Aerated lagoons are sized on the basis of an anticipated sewage organic loading per volume of lagoon. Operating water depths vary from 10-to 15- ft. The treatment system consists of primary and secondary lagoon cells with tertiary filtration, and effluent sampling and flow measurement. There are a few more mechanical components involved when compared to a non-aerated lagoon system. Again, such a WWTP facility may operate with a Fecal Coliform Exemption as well as lagoon exemption, which means that chlorination would not be required and higher effluent discharge limits.

As the name implies, air is supplied to these lagoons by a mechanical mean. Aeration in the lagoons can generally be accomplished by either diffused aeration equipment which includes aerators and a series of air piping headers, secured at the base of the lagoon with air supplied from centrally located air blowers; or with floating (surface) pontoon mounted aeration units. The capital cost of diffused aeration is relatively higher when compared with floating aerators, but it equalizes when capital costs as well as maintenance costs are compared for the two types. For efficient and successful lagoon treatment, the IEPA encourages the use of diffused aeration.

For the given design wastewater flow, the basis of design for an aerated lagoon treatment plant was prepared to allow determination of site layout requirements, preliminary equipment sizing and selection, and development of a preliminary cost budget. The BOD loading controls the design and the resultant lagoon sizes. Primary and secondary treatment includes primary and secondary lagoons of 4.0 and 2.0 acres, respectively. The lagoons are designed for a normal operating depth of 10 ft and storage depth of 12 ft above the lagoon bottom. A tertiary lagoon of 6.0 acres is designed for 90 days of winter storage and/or storage during excessive effluent ammonia. A small re-circulation pump station is also included to return secondary effluent to the primary lagoon to enhance treatment effectiveness and re-circulate wastewater within the system during low flow and/or high evaporation periods. Also, since a chlorination exemption can probably be obtained for lagoon WWTP effluent, no facilities are considered in this alternative for disinfection.

A typical layout of an aerated lagoon WWTP is shown in Figure 5. A preliminary basis of design for an aerated lagoon WWTP is given in Appendix A. A summary of preliminary cost estimates for the Aerated Lagoon WWTP is provided in Table 9.

7.3 Covered Lagoon WWTP

The physical design of the covered lagoon system would be very similar to either one of the lagoon systems discussed previously. Covering a lagoon, pond, basin or tank has shown by some to significantly reduce algae and odor associated with lagoons, as well as enhancing effluent quality in terms of BOD, SS and ammonia removal. However, when compared with other technologies, this type of lagoon system and its capabilities are not yet well documented or well proven. Similarly, the cover system on any lagoon introduces a large cost to the project. For example, the cost of the cover ranges from $3 to $5 per square foot, depending on the size of the lagoon.

A summary of preliminary cost estimates for a Covered Lagoon WWTP (based on LEMNA Technologies, Inc. system, consisting of the LemTec biological treatment system) is provided in Table 10.

7.4 Aerated Lagoons with Land Application Systems

Land application of wastewater involves the application of wastewater to vegetated land to provide treatment and to meet the growth needs of the vegetation. The applied wastewater is consumed through evapo-transpiration and/or percolates vertically and horizontally through the soil profile. Among the land application treatment systems, slow rate treatment is the leading natural treatment process in use, and is recommended by the IEPA.

Slow rate treatment systems are either classified as Type 1 or Type 2, depending on design objectives. In a Type 1 slow rate system, the principal objective is wastewater treatment and is controlled by the soil permeability. In Type 2 system, application rate is controlled by the crop irrigation needs. Wastewater can be applied to crops or vegetation by a variety of sprinkling methods (e.g. sprinkler distribution, center pivot system) or by surface techniques (such as graded border, furrow irrigation). The relatively low application rates combined with the presence of vegetation and the active soil ecosystem provide slow-rate systems with the highest treatment potential of the natural treatment systems.

IEPA design standards require secondary or tertiary treatment of domestic wastewater prior to land application. Also, allowance for weather dependency (freezing temperatures, excessive rains), fencing and groundwater monitoring is required.

For the Lake's wastewater flow, a basis of design for the land treatment system was prepared to allow determination of site layout requirements, preliminary equipment sizing and selection, and development of preliminary budget costs. With design average flow and 150 days storage requirement for slow rate land application system, it is proposed to design the primary and secondary lagoons for treatment and tertiary lagoon for storage. Primary and secondary treatment includes aerated primary and secondary lagoons of 4.0 and 2.0 acres, respectively, with a normal operating depth of 10.0 feet and maximum storage depth of 12.0 ft. A tertiary (storage) lagoon of 10 acres with a total storage depth of 9 ft, between minimum depth of 3 ft and maximum depth of 12 ft, would be provided. For land application of treated wastewater, overall 240 acres of farmland would be required, out of which approximately 175 acres would be irrigated using the center pivot sprinkler assemblies. A small re-circulation pump station is added to return tertiary effluent to the primary lagoon to enhance treatment effectiveness and re-circulate wastewater within the system during low flow and/or high evaporation periods.

A typical layout of a land application system with an aerated lagoon is shown in Figure 6. The preliminary basis of design for a land treatment system is given in Appendix A. A summary of preliminary cost estimates for the land application system is provided in Table 11.

Typically, a procurement of large farmland (and/or non-agricultural land) for wastewater disposal and continued management of farmland renders this options as unsuitable. Other disadvantages include weather dependency (freezing temperatures, excessive rains), and increased fencing and groundwater monitoring requirements, may make this option less desirable.

7.5 Mechanical (Trickling Filter) WWTP

A mechanical plant is a facility that uses machinery to assist in the treatment of wastewater in order to meet discharge criteria. A significant difference with mechanical plants is the separation and handling of solids. Thus in addition to treating and disposing of a liquid stream, a solids waste stream is generated and requires disposal. A mechanical wastewater treatment system would require primary, secondary and tertiary treatment processes to comply with NPDES discharge requirements.

In this section, cost estimates for a trickling filter (mechanical) WWTP are prepared as IEPA allows trickling filter WWTP, but do not allow an activated sludge WWTP for communities with a population equivalent of 2500 or less.

The trickling filter WWTP may be located on the site as discussed above in Section 6, near the west side of the Lake. Flow would reach the plant via the proposed collection system as described in previous sections. At the plant, an influent pump station would lift flow to allow gravity flow through the WWTP.

Treatment processes for trickling filter WWTP would include mechanical bar screens and a grit chamber at the headworks of the plant to remove larger solids and grit. Primary treatment to reduce settleable solids would be accomplished with circular primary clarifiers. Secondary treatment would consist of biological reduction of carbon BOD and ammonia with a trickling filter tank equipped with media and final settling tanks. The wastewater would then be polished with tertiary filters to meet NPDES requirements of 10 mg/l BOD and 12 mg/l SS. Sludge would be processed in aerobic digesters, dewatered with a belt press and then disposed of by land application to fields in accordance with Illinois EPA requirements.

A typical layout of a mechanical WWTP is shown in Figure 7. A preliminary cost estimate has been prepared for a trickling filter (attached growth mechanical) as identified in Table 12. Due to the excessive capital cost of a mechanical plant when compared to an aerated or covered lagoon WWTP and operation and maintenance complexities involved with a mechanical plant, no detailed basis of design is provided for this option. In order to reduce costs, grit removal and/or primary treatment may be eliminated. A number of new plants of this size do not include these units, mainly to keep costs down.

7.6 Onsite Wastewater Treatment System (Orenco Recirculating Sand Filter)

The most common type of onsite wastewater treatment system for individual residences and other establishments include septic tanks and multi-flow aerobic treatment systems with drain (leach) field and/or sand filter.

Here, the Orenco Recirculating Sand Filter (RSF) system is evaluated in conjunction with STEP collection system. The Orenco Recirculating Sand Filter (RSF) system can be regarded as a quasi onsite treatment system. The STEP collection system (as discussed previously) uses the pressure sewer system in conjunction with septic tanks. In short, raw sewage flows from a house or business to watertight underground single or double compartment septic tanks and dosing tanks, where it is pretreated. For a typical septic tank, the Orenco System offers a biotube vault, which filters out solids and only pumps out liquid. Following primary treatment in a septic tank, filtered wastewater is pumped to shallow, main collection lines. The main collection lines transport the wastewater to the RSF central location for further treatment. Solids remain in the underground septic tank, for passive and natural treatment. Individual septic tanks would typically need pumping once every 1-3 years.

The Orenco RSF system consists of a re-circulation tank where mixing and biochemical treatment takes place. Pumps in the re-circulation tank deliver the wastewater to the re-circulating sand filter in frequent doses. With each dose, the wastewater percolates through the coarse sand, where naturally occurring microorganisms organically break down remaining contaminants. In the bottom of the sand filter, treated effluent is collected and conveyed back to the re-circulation tank for mixing with incoming wastewater. After a few passes through the sand filter bed and re-circulation tank, the treated wastewater is ready for discharge. Final disposal of the effluent from sand filter/re-circulation tank will be accomplished by means of surface discharge to a nearby creek.

For the Lake Bloomington treatment system, Orenco suggested dividing the Lake into two separate treatment streams, the eastern half (150 connections) and western half (250 connections). They also suggested separate RSF treatment systems and effluent discharge locations. As opposed to the Orenco two location system, it is proposed here to combine all the flows to the northwestern location as indicated for other options. This is proposed to avoid maintaining two separate systems at two distant locations, two effluent discharge locations and permits, possibility of stringent effluent requirements for the east discharge location, limited flexibility to deal with future discharge requirements, etc. Hence, this system will be designed according to Orenco guidelines but would be constructed at a single location. A preliminary Basis of Design for this system is also given in Appendix A. A summary of preliminary cost estimates for this system is provided in Table 13. Overall, this system would require approximately an area of five acres.

For Lake Bloomington, it is proposed that this (STEP collection with RSF treatment) system be fully maintained by City of Bloomington personnel. Property owners maintaining their own septic tank is not always the least expensive and/or best option. Similarly, this system requires regular maintenance by the individual homeowner, which may be too intensive for some homeowners. The routine maintenance would include regular pumping of septic tanks, typically every two years; and checking with the occasional repair/replacement of biotube vaults and pumping stations.

7.7 Transfer of the Lake's Wastewater to Bloomington and Normal Water Reclamation District (BNWRD)

In this section, transfer of the Lake's wastewater to the BNWRD West WWTP and/or new Southeast WWTP was investigated. This alternate is evaluated on the basis that the City of Bloomington would own, manage and maintain the sewage collection system, pump station, forcemain and related ancillaries for Lake Bloomington. BNWRD would manage the treatment of waste received from the City's Lake residents. The Lake area's residents would have to pay a sewer connection fee, which may be negotiated with mile downstream of Lake Bloomington. See Figure 1. The cost estimate for an outfall discharge pipe is shown in Table 19.

7.9 Summary and Comparison of Treatment / Transfer Options

Detailed cost estimates are prepared for various wastewater treatment/transfer alternatives which include: non-aerated lagoon WWTP, aerated lagoon WWTP, covered lagoon WWTP, lagoon with land application of wastewater, mechanical WWTP, onsite treatment systems (Orenco RSF system in conjunction with STEP collection system) and five wastewater transfer options as detailed in the previous sections. See Tables 7 through 19. Further evaluation and selection of the best treatment alternate or transfer option is based on a calculation of the monthly user charge, which includes construction costs as well as operational, maintenance and replacement (OM&R) costs. Tables 20 (a through f) and 21 show operational, maintenance and replacement costs for various treatment/transfer alternatives as discussed previously. Tables 22 and 23 show a quick review and summary of various wastewater treatment alternatives and transfer options, respectively. A comparison and discussion will follow in the next sections.

8.0 ENVIRONMENTAL IMPACTS

8.1 Direct Impacts

Archeological, historic and cultural site and resources: The proposed project primarily consists of piping installed in developed and previously disturbed areas, and the construction of a WWTP. A request will be submitted to the Illinois Historic Preservation Agency to determine the potential impact that the project will have on cultural/historic resources.

Rare and Endangered Species: A request will be submitted to the Illinois Department of Natural Resources to determine potential species that may be impacted by construction of the project.

Wetlands, floodplain and stream crossings: The project consists of an outfall sewer that discharges to a tributary to Money Creek, which flows into the Mackinaw River. The sewers will be constructed to IEPA standards with the necessary cover at any crossing. Stream flow will be maintained during construction, and the channel will be restored to its original condition. A request would need to be submitted to the Illinois Department of Natural Resources during design to determine other potential impacts to wetlands, floodplains and stream crossings in the project area.

Agricultural land construction: The project will primarily consist of piping and WWTP construction. Associated influent pump stations will require little land area. Impacts to agricultural land may only consist of pipe trenching on the agricultural property fringe and construction of lagoons. If needed, a request will be submitted to the Illinois Department of Agriculture to determine potential impacts that the project may have on agricultural land.

Air quality: The project does not appear to cause any adverse air quality affect. Construction activities may produce dust, asphalt fumes and vehicle exhaust. There is also a small potential for odor production at pump stations.

Impacts to surface and groundwater: No significant impacts to surface or groundwater quality are expected because WWTP effluent would be treated and discharged according to the State of Illinois standards. Discharge requirements will be established by the IEPA during the NPDES permitting process. The permitting process will ensure that effluent discharge will allow the receiving waters to meet water quality standards.

Receiving stream: The effluent discharged to the receiving stream would increase the flow as well as BOD and SS loading within the stream. A discharge of WWTP effluent to the receiving stream could also generate some increased erosion and/or sedimentation. However, a greater benefit of improved surface and groundwater quality will be realized through the elimination of number of illegal discharges with no treatment and/or septic tank discharges with partial treatment in and around the Lake. If a new treatment plant is not constructed, various Lake area residents would continue to have either no treatment, an improper treatment, and/or failing septic systems and will continue discharging partially treated or untreated wastewater to nearby streams, ditches and the Lake. The McLean County Health Department would also be unable to continue with the Septic Tanks Elimination Program.

8.2 Secondary Impacts

Most environmental impacts of the project will be beneficial as a result of the new wastewater treatment and collection system. The Lake's surrounding area may experience an increased level of growth with the construction of a municipal sewage collection and treatment system. Type of growth will vary, with the potential for construction of commercial as well as single- and multiple-family housing. Current development requires the construction of septic tanks and sand filters or leach fields. These sewage systems do not provide the same level of waste treatment that the municipal system will provide. Already, space limitations, failure of the septic tank systems and pollution of Lake Bloomington and surrounding creeks and tributaries are becoming a substantial problem.

If a sewage collection and treatment system is constructed, all existing homes and businesses will be connected to the municipal system so that the corresponding level of waste treatment will be provided for the Lake Bloomington residents. There will be minimum disturbance to sensitive ecosystems, wild and scenic rivers, and cultural or recreational areas. The only potential secondary impacts will be minor construction related impacts, such as increased truck traffic and temporary disturbance of vegetation due to earthwork at the lagoons. Enforcing roadway weight limits and erosion control measures during construction will mitigate these impacts.

9.0 RECOMMENDED PLAN

9.1 Project Summary

This Facility Plan has been prepared to evaluate options for a wastewater collection and treatment system to serve the Lake Bloomington community and has been prepared through the direction of the City of Bloomington's Director of Engineering and Water Department and Board of Trustees. This Facility Plan is the first step in meeting the requirements of the Illinois Department of Commerce and Community Development Assistance Program for a Planning Assistance Grant and the IEPA for low interest loan financing.

This Facility Plan evaluates various types of sewage collection and treatment/transfer systems. The plan provides a preliminary layout of multiple suitable sewage collection system to serve the existing developed parts of the Lake Bloomington and surrounding areas. An engineering evaluation was also performed for various wastewater treatment and transfer alternatives, which includes: Non-Aerated Lagoon WWTP; An Aerated Lagoon WWTP; Covered Lagoon WWTP; Land Application of Wastewater; Mechanical (Trickling Filter) WWTP; onsite wastewater treatment systems; and five options of the Lake area's wastewater transfer to the BNWRD. Various viable collection and treatment/transfer alternatives were identified, discussed and detailed in the previous sections with cost estimates.

The cost estimates for the Lake Bloomington wastewater collection and treatment/transfer system include planning/engineering, construction, bidding and construction observation, contingency as well as annual operational, maintenance and replacement (OM&R) costs. These cost estimates do not include legal costs, nor do they include costs for acquisition of sewer easements, right-of-way, etc. These costs are considered adequate for planning and budgetary purposes.

Table 1 shows Lake Bloomington's existing and permitted septic tanks information. Table 2 shows the existing population as well as population projections for the next 20 years. Tables 3 through 13, and 19 indicate preliminary cost estimates for the sewage collection system, influent pump station, wastewater treatment alternatives and outfall (discharge) sewer to an unnamed tributary of Money Creek. Tables 14 through 18 show the cost estimates for the Lake area's wastewater transfer options to the BNWRD. Tables 20 (a to f) and 21 indicate the operational, maintenance and replacement costs for various treatment and transfer options. Tables 22 and 23 illustrate a summary and comparison of various treatment and transfer options as well as user charges for various alternatives. Tables 24, 25 and 26 demonstrate the calculations of the user charge for aerated and covered lagoon WWTP's as well as wastewater transfer option to the BNWRD future Six Mile Creek Pump Station for various grant and loan scenarios.

Among all the sewer collection systems evaluated in this Facility Plan, the pressure sewer collection system prevails as the most suitable and economical system for the Lake Bloomington residents.

Overall, among various treatment/transfer systems, the least cost alternative is to build an aerated lagoon treatment system at the identified site location in the northwest portion of the Lake. The second cost effective alternative is the covered lagoon system; small footprint and comparable costs when judge against the aerated lagoon system makes this option attractive. The sizeable land requirement and/or City's reluctance for managing a wastewater system for the Lake community may make a treatment alternative unfavorable.

Among the wastewater transfer options, the least-cost alternative is to pump the wastewater to the BNWRD Future Six-Mile Creek Pump Station in conjunction with the City of Lexington. However, transferring wastewater to BNWRD may not be cost effective for the City of Lexington; and Lexington may consider building its own WWTP.

The second cost-effective wastewater transfer option for Lake Bloomington is to pump wastewater from the proposed West Pump Station to the BNWRD future Six-Mile Creek Pump Station. Among wastewater transfer options, this is the recommended option. If the City decides on this alternative, then the City of Bloomington needs to coordinate inter-governmental and initial planning details with BNWRD.

In general, evaluation of costs and the user charge per month reveals that the construction of a pressure sewer system with an aerated lagoon system at the identified site seems to be the most suitable treatment alternative for Lake Bloomington. Lagoon systems are also considered as the preferred treatment process for communities with a population of 2500 PE or less. Also, the lagoon system has minimum operational and maintenance requirements when compared to some other treatment alternatives

9.2 Financial Evaluation

The City may plan to primarily finance the construction project for the Lake Bloomington collection and treatment system through the IEPA low interest loan program. For planning and monthly user charge calculations, IEPA 20 year loan program with a current interest rate of 2.50% (established by IEPA for 8/2003 to 7/2004) was used to generate loan repayment amounts. The monthly user charge is calculated assuming 400 customers (residential household or commercial user) and usage of 5,000 gallons of water per user.

In addition to loan options, the City may consider generating part of the revenue for construction by leasing additional lots around Lake Bloomington. The City may also consider an up front one-time large connection charge (in addition to monthly charge) and/or increase the leasing rent for residential housing land around the Lake to reduce the overall debt associated with the capital improvements. A report for the study of sewage collection and treatment system financing alternatives should be started as a next step.

Overall, within all the collection systems evaluated in this Facility Plan, the pressure sewer collection system with PVC pipe appears to be the most suitable and economical system for the Lake Bloomington area's wastewater. The capital construction cost for the pressure sewer system with PVC pipe is estimated to be $6,385,000. This cost can be reduced by approximately $450,000, if the City decides not to build the sewers for the less populated area in the southern (upstream) part of the Lake. See Table 5.

Among all the wastewater treatment and transfer alternatives evaluated in this report, the least cost option is an aerated lagoon treatment system. The overall capital construction cost and annual operational, maintenance and replacement (OM&R) cost for the pressure sewer system and aerated lagoon WWTP is $9,786,000 and $ 106,921, respectively. With a 100% IEPA financed loan, the annual average cost is calculated as $734,665/yr, and an average user charge is $153.06/month/user. With a 50% grant and 50% loan, an average user charge would be $87.67/month/user. See Tables 22 and 24.

The second cost effective collection and treatment alternative is the covered lagoon system; this system may be considered advantageous because of smaller footprint when compared to the aerated lagoon system. The capital construction cost and annual OM&R cost for the covered aerated lagoon system with pressure sewer system is $9,800,000 and $129,281, respectively. For covered lagoon system, an evaluation of user charge with various loan/grant scenarios is also performed and attached in Table 25.

Within wastewater transfer options, transfer of the Lake area's wastewater to the BNWRD Six-Mile Creek Pump Station is the second least-cost option. See Table 23. The capital cost and the OM&R for this option (including pressure collection system and the transfer of the Lake area's wastewater to the BNWRD Six-Mile Creek Pump Station) are estimated as $10,931,000 and $105,801, respectively. Based on these costs and a 100% IEPA loan, an average per user charge for the system is calculated as $172.47/month. If 50% of the project is constructed with grants or other resources and the rest is financed with an IEPA loan, the average annual cost for the construction as well as OM&R of the treatment system is estimated at $456,397. Here, an average sewer user rate of $99.43/month/user would be required to meet annual costs for loan repayments. See Table 26.

9.3 Potential Grants and Loan Programs

This section has been prepared to provide an overview of various grants, loans, and local finance options that are available today. It provides a summary of some major funding and/or financing sources relevant to this project. However, this listing should not be considered comprehensive.

9.3.1 Illinois First – Member Initiative Grants

The Illinois Legislature provides a wide range of grants to communities based on need and inability to otherwise finance projects. These grants are wide ranging in terms of dollar amounts and types of projects financed. These grants are very effective and have produced significant improvements throughout the state. Due to timing constraints of other grant programs, the City of Bloomington may want to consider requesting an Illinois First Grant as a funding mechanism for design of the project.

9.3.2 Illinois Department of Commerce & Community Affairs (DCCA)

Illinois Department of Commerce & Community Affairs offers community Development Assistance Program (CDAP) Grants. It is a program that provides grants and loans that benefit lower income people where there is a local threat to health and safety. The relevant components of this program to the City include:

a. Engineering Design Grant – A new program established to provide financing for previously identified problems. The goal of this program is to expedite construction by financing the plans and specification for improvements. The maximum grant amount is $100,000, and there is no local match required. However, the

$100,000 would only cover a portion of the engineering design. A community's income eligibility is required for participation.

b. Public Facilities Grants – Include common, non-maintenance public works activities like improvements to municipal sewer and water systems. The maximum grant amount is $400,000 and local funds are also required. This program has been very successful in assisting small communities with their infrastructure needs. A community's income eligibility is required for participation. Deadline for application to these grants is around early October.

c. Economic Development Grants – Provide a grant (up to $ 500,000) to a unit of local government to either make infrastructure improvements in support of economic development activities, or to be loaned to a developer to make improvements that retain or create jobs. Local match money is usually required. There is no specific deadline for these grants.

9.3.3 United States Department of Agriculture – Rural Development (USDA-RD)

This program was formerly known as Farmer's Home Administration (FmHA). The program provides a variety of loan guaranties, loans and grants to small rural communities and special use districts (water and sewer districts). Their programs can also provide funding for emergency vehicles, buildings for the operation of the government, and programs similar to the DCCA offerings. USDA-RD can offer a combination of loan and grant funding. The ability to pay and the ability to finance any other way determine interest rates. Interest rates are assigned, on a sliding scale, by the median household income of the community. There is no specific deadline for these grants and/or loans.

9.3.4 *IEPA - Water Pollution Revolving Fund*

This is an IEPA Water Pollution Revolving Fund or Low Interest Loan Program. This program provides low interest loans to municipalities or other units of local government that are responsible for the collection and/or treatment of wastewater. The loans are for non-maintenance projects that improve the capabilities to collect and/or treat wastewater. The loans are one-half (1/2) of the State's bond interest rate at the time the loan is approved. The interest rate for 8/2003 to 7/2004 is 2.50%. It is not limited to areas with high levels of poverty and low levels of funds. Projects can include sanitary sewer extensions, improvements to the wastewater treatment plant and relief sewers to alleviate basement flooding, etc. Deadline for submitting pre-application for these loans is the end of March; however, the actual loan application packages can be submitted at any time. Submitting a pre-application may allow a community to be included in Illinois EPA's recommended funding program for the next fiscal year.

9.3.5 *Illinois Environmental Protection Agency (IEPA) – Unsewered Communities Grant Program*

The objective of this grant program is to provide affordable wastewater collection and treatment to existing unsewered communities, which are primarily residential in nature and have a history of public health or water pollution issues resulting from inadequate wastewater disposal systems. This grant program may be coupled with the IEPA's Low Interest Loan program or any other financial assistance available to the community. To be eligible for grant assistance, a unit of local government must have been incorporated on or before July 1, 1988. Also, the community must lack a permitted sanitary sewerage system to serve the existing population and must be on an enforceable schedule (a Court Order, an Illinois Pollution Control Board order or Compliance Commitment Agreement negotiated with the Illinois EPA). The maximum amount of grant assistance is limited to $5 million for any one applicant on a cumulative basis. Grant percentages can vary from 10% to 70% of eligible project costs depending on the median household income of communities applying for grants.

9.3.6 Other City of Bloomington Funding Resources

The City may consider generating some revenue by leasing additional lots around Lake Bloomington. The City may also consider an up front one-time large connection charge (in addition to monthly charge) and/or increase the leasing rent for residential housing land around the Lake to reduce the overall debt associated with the capital improvements. A report for the study of sewage collection and treatment system financing alternatives should be started as a next step. This report will detail alternate financing methods that may offset the IEPA loan repayment.

9.4 Preliminary Implementation Schedule

1. Facility Plan and NPDES permit approval process — 1-3 years
   a. City approval of the Facility Planning Report
   b. Submit Facility Planning Report to IEPA
   c. Obtain sign-off from reviewing agencies on proposed WWTP location
   d. Submit request for new NPDES permit for wastewater discharge
   e. Request lagoon and chlorination exemptions from IEPA
   f. Request to create a Facility Planning Area

2. Local zoning approval — 3-12 months
   a. Submit special use permit request to McLean County

3. Upon successful completion of Steps #1 and #2
   a. Project Design — 12 months

b.	IEPA construction plans review and issuance of construction permit	6 months
c.	Advertise for bids and contract award	6 months
d.	Construction and startup	12-18 months

The above schedule does not show financial items related to obtaining loans, grants and other financing. It is recommended this activity get started in Step #1 if IEPA low interest loan is to be obtained for financing of this project.

Tables

Table 1 -- Existing Individual Household Septic System Information ***

Prepared by Farida S. Goderya

Subdivision	Total	Decades B/f 1950	1950's	1960's	1970's	1980's	1990's
LB - Iroquois	35	2	9	2	8	6	8
LB - Peoria Point	20			1	9	3	7
LB - Estates	1						1
LB - Heights	5						5
LB - Potowatomie	80	4	20	9	9	15	23
LB - Hickory Heights	60		2	22	16	11	9
LB - Highlands	40			9	13	7	11
LB - Kickapoo	103	5	18	9	14	16	41
Total	**344**	**11**	**49**	**52**	**69**	**58**	**105**

***** Based on Information form McLean County Environmental Health Department *****

Note: The decades represent the time when the Health Department gave the final approval of the actual installaion or repair work.

Table 2 -- Projection Estimates for Housing Units and Population

Prepared by Farida S. Goderya

Year	Housing Units	Population
2000	400	1400
2005	400	1400
2010	440	1540
2015	484	1694
2020	532	1863
2025	586	2050
2030	644	2255
2035	709	2480

Note: Projections are based on an annual 2% growth rate

Table 3 -- Vacuum Sewers Collection System -- Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
3" Vacuum Laterals (From Valve pit to Vacuum Mains)	LF	40000	$11.0	$440,000
4" Vacuum Sewer Main	LF	33800	$20.0	$676,000
6" Vacuum Sewer Main	LF	20700	$25.0	$517,500
8" Vacuum Sewer Main	LF	5000	$35.0	$175,000
Crossover Connections	EA	211	$400.0	$84,400
4" Division Valves	EA	35	$800.0	$28,000
6" Division Valves	EA	27	$1,000.0	$27,000
8" Division Valves	EA	7	$1,500.0	$10,500
AirVac Valve Pits	EA	210	$3,500.0	$735,000
Vacuum Stations	EA	3	$300,000	$900,000
Pump Stations	EA	3	$55,000	$165,000
4" Forcemain (FM1)	LF	3,500	$17	$59,500
6" Forcemain (FM2)	LF	4,500	$20	$90,000
6" Forcemain (FM3)	LF	16,400	$20	$328,000
6" Forcemain (FM2) Directional Drilling Under Lake	LF	1,000	$85	$85,000
Single Valve Buffer Tanks	EA	3	$10,000	$30,000
Dual Valve Buffer Tanks	EA	3	$15,000	$45,000
Individual Household Packaged Pump Stations	EA	55	$4,500	$247,500
Forcemain from Individual Pump Stations	LF	15000	$15	$225,000
End of Line Cleanouts	EA	35	$850	$29,750
End/Change of Line Access	EA	35	$650	$22,750
Portable Vacuum Pump, Spare Parts and Special Tools	EA	3	$27,000	$81,000
Septic Tanks Abandonment	EA	400	$600	$240,000
Generators	EA	3	$55,000	$165,000
Electrical and Controls	EA	3	$35,000	$105,000
Surface Restoration	LF	135000	$1.5	$202,500
Streets Crossing	EA	200	$700	$140,000
Other Miscellanous	LS	1	$50,000	$50,000
Estimated Construction Costs				$5,904,400
Contingency (10% of Construction Costs)				$590,440
Total estimated construction costs				$6,494,840
Engineering (15% of construction costs)				$974,000
Construction Observation (10% of construction costs)				$649,000
Total Estimated Capital Cost				**$8,118,000**

Note: Twenty two properties south of the Lake are beyond the reach of the Vacuum Collection System and are not included in this estimate

Table 4 -- Low Pressure Sewers Collection System (With HDPE Pipe)--Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
1.25" or 1.5" HDPE Service Lines	LF	40000	$10.0	$400,000
< = 3.0" HDPE	LF	78500	$13.0	$1,020,500
4.0" HDPE	LF	6900	$15.0	$103,500
5.0" HDPE	LF	2000	$20.0	$40,000
6.0" HDPE	LF	7500	$25.0	$187,500
8.0" HDPE	LF	15400	$30.0	$462,000
10.0" HDPE	LF	2800	$35.0	$98,000
Packaged Grinder Pump Stations	EA	400	$4,200	$1,680,000
Curb Stop Valves	EA	400	$350	$140,000
Check Valve with Valve Box	EA	400	$400	$160,000
End of Line Cleanouts	EA	35	$850	$29,750
Inline Flushing Assemblies	EA	35	$650	$22,750
Air/Vacuum Release Valve	EA	10	$1,500	$15,000
Septic Tanks Abandonment	EA	400	$600	$240,000
Electrical Service	EA	400	$400	$160,000
Surface Restoration	LF	30000	$2	$60,000
Streets Crossing	EA	25	$700	$17,500
Lake Crossing	LF	1000	$85	$85,000
Other Miscellanous	LS	1	$50,000	$50,000
Estimated Construction Costs				$4,971,500
Contingency (10% of Construction Costs)				$497,150
Total estimated construction costs				$5,468,650
Engineering (15% of construction costs)				$820,000
Construction Observation (10% of construction costs)				$547,000
Total Estimated Capital Cost				**$6,836,000**

Table 5 -- Low Pressure Sewers Collection System (With PVC Pipe)--Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
1.25" or 1.5" PVC Service Lines	LF	40000	$8.0	$320,000
< = 3.0" PVC	LF	78500	$9.0	$706,500
4.0" PVC	LF	6900	$14.0	$96,600
5.0" PVC	LF	2000	$15.0	$30,000
6.0" PVC	LF	7500	$18.0	$135,000
8.0" PVC	LF	15400	$23.0	$354,200
10.0" PVC	LF	2800	$30.0	$84,000
Packaged Grinder Pump Stations	EA	400	$4,200	$1,680,000
Curb Stop Valves	EA	400	$350	$140,000
Check Valve with Valve Box	EA	400	$400	$160,000
End of Line Cleanouts	EA	35	$850	$29,750
Inline Flushing Assemblies	EA	35	$650	$22,750
Air/Vacuum Release Valve	EA	10	$1,500	$15,000
Septic Tanks Abandonment	EA	400	$600	$240,000
Electrical Service	EA	400	$400	$160,000
Surface Restoration	LF	153000	$1.5	$229,500
Streets Crossing	EA	150	$700	$105,000
Lake Crossing	LF	1000	$85	$85,000
Other Miscellanous	LS	1	$50,000	$50,000
Estimated Construction Costs				$4,643,300
Contingency (10% of Construction Costs)				$464,330
Total estimated construction costs				$5,107,630
Engineering (15% of construction costs)				$766,000
Construction Observation (10% of construction costs)				$511,000
Total Estimated Capital Cost				**$6,385,000**

Table 6 -- Septic Tank Effluent Pressure (STEP) Sewer Collection System -- Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
Collection with Primary Treatment System				
1.25" or 1.5" PVC Service Lines	LF	40000	$8.0	$320,000
3.0" PVC	LF	78500	$9.0	$706,500
4.0" PVC	LF	6900	$14.0	$96,600
5.0" PVC	LF	2000	$15.0	$30,000
6.0" PVC	LF	7500	$18.0	$135,000
8.0" PVC	LF	15400	$23.0	$354,200
10.0" PVC	LF	2800	$30.0	$84,000
Initial Septic Tanks Cleaning and Inspection	EA	400	$300	$120,000
Orenco Retrofit for Existing Septic Tanks	EA	100	$3,500	$350,000
New Orenco Septic Tanks and Equipment	EA	300	$5,200	$1,560,000
Existing Septic Tanks Abandonment	EA	300	$450	$135,000
Curb Stop Valves	EA	400	$350	$140,000
Check Valve with Valve Box	EA	400	$400	$160,000
End of Line Cleanouts	EA	35	$850	$29,750
Inline Flushing Assemblies	EA	35	$650	$22,750
Air/Vacuum Release Valve	EA	10	$1,500	$15,000
Electrical Service	EA	400	$450	$180,000
Surface Restoration	LF	153000	$1.5	$229,500
Streets Crossing	EA	150	$700	$105,000
Lake Crossing	LF	1000	$85	$85,000
Other Miscellanous	LS	1	$50,000	$50,000
Estimated Construction Costs				$4,908,300
Contingency (10% of Construction Costs)				$490,830
Total estimated construction costs				$5,399,130
Engineering (15% of construction costs)				$810,000
Construction Observation (10% of construction costs)				$540,000
Total Estimated Capital Cost				**$6,749,000**

Table 7 -- Influent Pump Station and Forcemain

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Item Cost
Pump Station				
Excavation / Earthwork	CY	500	$25	$12,500
Wet well / valve vault structures	CY	50	$600	$30,000
Dewatering	DAY	5	$700	$3,500
Pumps, floats, level control, cables, rail, base elbows	LS	1	$35,000	$35,000
Piping and Valves	LS	1	$20,000	$20,000
Misc. patches/grout/fillets/cleanup	LS	1	$5,000	$5,000
Generator	LS	1	$45,000	$45,000
MCC and electrical	LS	1	$55,000	$55,000
Force Main				
10" SDR 21 forcemain	LF	1500	$30	$45,000
Roads crossing	LF	60	$200	$12,000
Allowance for tie in into WWTP	LS	1	$5,000	$5,000
Air release valve and manholes	EA	2	$5,000	$10,000
Seeding, fertilizing	LF	3000	$2	$6,000
Miscellaneous	LS	1	$10,000	$10,000
Estimated Construction Costs				$294,000
Contingency (10% of Construction Costs)				$29,400
Total estimated construction costs				$323,400
Engineering (15% of construction costs)				$49,000
Construction Observation (10% of construction costs)				$32,000
Total Estimated Capital Cost				**$404,000**

Table 8 -- Non-Aerated Lagoon Wastewater Treatment Plant Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
Primary Lagoon				
Site Clearing	Acres	22	$6,000	$132,000
Excavation	CY	131,200	$5	$656,000
Rip Rap	Ton	4,600	$30	$138,000
2' Clay Liner and compaction	Ton	79,200	$5	$396,000
Secondary Lagoon				
Site Clearing	Acres	6	$6,000	$36,000
Excavation	CY	33,400	$6	$200,400
Rip Rap	Ton	1,650	$30	$49,500
2' Clay Liner and compaction	Ton	19,400	$5	$97,000
Sand Filter				
Site Clearing	Acres	3	$6,000	$18,000
Excavation	CY	14200	$6	$85,200
Rip Rap	Ton	1800	$30	$54,000
Sand	Ton	4400	$25	$110,000
Gravel	Ton	2600	$25	$65,000
Piping				
8", PVC SDR 26 (Sand Filter)	LF	3500	$20	$70,000
10", PVC SDR 26 (Sand Filter)	LF	1000	$25	$25,000
10", PVC SDR 26 (Misc. Piping)	LF	1000	$30	$30,000
12", PVC SDR 26 (Misc. Piping)	LF	500	$35	$17,500
8", Recirculation Forcemain, PVC SDR 21	LF	1000	$20	$20,000
Valves				
8", plug valves, box and stem	EA	4	$2,500	$10,000
10", plug valves, box and stem	EA	8	$3,000	$24,000
12", plug valves, box and stem	EA	4	$4,000	$16,000
Telescoping valves	EA	2	$9,000	$18,000
Miscellaneous Items				
Manholes	EA	5	$2,500	$12,500
Access Covers	EA	7	$1,500	$10,500
Stop Logs	LS	3	$1,500	$4,500
Recirculation Pump Equipment	LS	1	$30,000	$30,000
Weir manholes	EA	2	$5,000	$10,000
Sampler	LS	1	$10,000	$10,000
Ultrasonic Level Transducer	EA	2	$4,500	$9,000
Flow Measurement Equipment	EA	1	$12,000	$12,000
Depth Markers	EA	4	$1,000	$4,000
Fencing	LF	6000	$10	$60,000
Soil Borings	LS	1	$15,000	$15,000
Topographic Survey	LS	1	$20,000	$20,000
Electrical & Controls	LS	1	$30,000	$30,000
Permitting	LS	1	$15,000	$15,000
Cost of Land	Acres	40	$5,000	$200,000
Estimated Construction Costs				$2,710,100
Contingency (10% of Construction Costs)				$271,010
Total estimated construction costs				$2,981,110
Engineering (15% of construction costs)				$447,000
Construction Observation (10% of construction costs)				$298,000
Total Estimated Capital Cost				**$3,726,000**

Table 9 -- Aerated Lagoon Wastewater Treatment Plant Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
Primary Lagoon				
Site Clearing	Acres	4	$6,000	$24,000
Excavation	CY	26,050	$6	$156,300
Rip Rap	Ton	1,350	$30	$40,500
2' Clay Liner and compaction	Ton	7,450	$5	$37,250
Secondary Lagoon				
Site Clearing	Acres	3	$6,000	$18,000
Excavation	CY	16,000	$6	$96,000
Rip Rap	Ton	900	$30	$27,000
2' Clay Liner and compaction	Ton	2,500	$5	$12,500
Tertiary (Storage) Lagoon				
Site Clearing	Acres	6	$6,000	$36,000
Excavation	CY	55,200	$5	$276,000
Rip Rap	Ton	3,850	$30	$115,500
2' Clay Liner and compaction	Ton	17,600	$5	$88,000
Sand Filter				
Site Clearing	Acres	3	$6,000	$18,000
Excavation	CY	14200	$6	$85,200
Rip Rap	Ton	1800	$30	$54,000
Sand	Ton	4400	$25	$110,000
Gravel	Ton	2600	$25	$65,000
Piping				
8", PVC SDR 26 (Sand Filter)	LF	3500	$20	$70,000
10", PVC SDR 26 (Sand Filter)	LF	1000	$25	$25,000
10", PVC SDR 26 (Misc. Piping)	LF	1000	$30	$30,000
12", PVC SDR 26 (Misc. Piping)	LF	500	$35	$17,500
8", Recirculation Forcemain, PVC SDR 21	LF	1000	$20	$20,000
Valves				
8", plug valves, box and stem	EA	4	$2,500	$10,000
10", plug valves, box and stem	EA	8	$3,000	$24,000
12", plug valves, box and stem	EA	4	$4,000	$16,000
Telescoping valves	EA	2	$9,000	$18,000
Miscellaneous Items				
Diffused Aeration Equipment	LS	1	$100,000	$100,000
Blowers and Accessories	LS	1	$55,000	$55,000
Manholes	EA	7	$2,500	$17,500
Access Covers	EA	7	$1,500	$10,500
Stop Logs	LS	3	$1,500	$4,500
Recirculation Pump Equipment	LS	1	$30,000	$30,000
Weir manholes	EA	3	$5,000	$15,000
Sampler	LS	1	$10,000	$10,000
Ultrasonic Level Transducer	EA	2	$4,500	$9,000
Flow Measurement Equipment	EA	1	$12,000	$12,000
Depth Markers	EA	4	$1,000	$4,000
Fencing	LF	4500	$10	$45,000
Soil Borings	LS	1	$15,000	$15,000
Topographic Survey	LS	1	$15,000	$15,000
Electrical & Controls	LS	1	$110,000	$110,000
Permitting	LS	1	$15,000	$15,000
Cost of Land	Acres	20	$5,000	$100,000
Estimated Construction Costs				$2,057,250
Contingency (10% of Construction Costs)				$205,725
Total estimated construction costs				$2,262,975
Engineering (15% of construction costs)				$339,000
Construction Observation (10% of construction costs)				$226,000
Total Estimated Capital Cost				**$2,828,000**

Table 10 -- Covered Aerated Lagoon (Lem Tec) Wastewater Treatment Plant Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
Bar Screen and Influent Channel	LS	1	140,000	$140,000
Primary Lagoon				
Site Clearing	Acres	4	$6,000	$24,000
Excavation	CY	26,050	$6	$156,300
Rip Rap	Ton	1,350	$30	$40,500
2' Clay Liner and compaction	Ton	7,450	$5	$37,250
Secondary Lagoon				
Site Clearing	Acres	2	$6,000	$12,000
Excavation	CY	16,000	$6	$96,000
Rip Rap	Ton	900	$30	$27,000
2' Clay Liner and compaction	Ton	2,500	$5	$12,500
Polishing Reactor				
Site Clearing	Acres	1	$6,000	$6,000
Excavation	CY	9200	$6	$55,200
Concrete	CY	250	$600	$150,000
Piping and Valves	LS	1	$25,000	$25,000
Miscellaneous Equipment Items	LS	1	$55,000	$55,000
Piping				
10", PVC SDR 26 (Misc. Piping)	LF	1000	$30	$30,000
8", Recirculation Forcemain, PVC SDR 21	LF	1000	$20	$20,000
Valves				
8", plug valves, box and stem	EA	4	$2,500	$10,000
10", plug valves, box and stem	EA	8	$3,000	$24,000
12", plug valves, box and stem	EA	4	$4,000	$16,000
Telescoping valves	EA	2	$9,000	$18,000
Miscellaneous Items				
Primary Lagoon Cover	SF	125000	$3	$375,000
Secondary Lagoon Cover	SF	58000	$3	$174,000
Polishing Reactor Cover	SF	17000	$3	$51,000
Aeration and other Proprietary Equipment	LS	1	$115,000	$115,000
Blowers and Accessories	LS	1	$55,000	$55,000
Manholes	EA	4	$2,500	$10,000
Access Covers	EA	3	$1,500	$4,500
Stop Logs	LS	3	$1,500	$4,500
Recirculation Pump Equipment	LS	1	$30,000	$30,000
Weir manholes	EA	2	$5,000	$10,000
Sampler	LS	1	$10,000	$10,000
Ultrasonic Level Transducer	EA	2	$4,500	$9,000
Flow Measurement Equipment	EA	1	$12,000	$12,000
Depth Markers	EA	3	$1,000	$3,000
Fencing	LF	2000	$10	$20,000
Soil Borings	LS	1	$15,000	$15,000
Topographic Survey	LS	1	$15,000	$15,000
Electrical & Controls	LS	1	$110,000	$110,000
Permitting	LS	1	$15,000	$15,000
Cost of Land	Acres	15	$5,000	$75,000
Estimated Construction Costs				$2,067,750
Contingency (10% of Construction Costs)				$206,775
Total estimated construction costs				$2,274,525
Engineering (15% of construction costs)				$341,000
Construction Observation (10% of construction costs)				$227,000
Total Estimated Capital Cost				**$2,843,000**

Table11 -- Aerated Lagoons with Land Application System Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
Primary Lagoon				
Site Clearing	Acres	4	$6,000	$24,000
Excavation	CY	26,050	$6	$156,300
Rip Rap	Ton	1,350	$30	$40,500
2' Clay Liner and compaction	Ton	7,500	$5	$37,500
Secondary Lagoon				
Site Clearing	Acres	3	$6,000	$18,000
Excavation	CY	16,000	$6	$96,000
Rip Rap	Ton	900	$30	$27,000
2' Clay Liner and compaction	Ton	2,500	$5	$12,500
Storage (Tertiary) Lagoon				
Site Clearing	Acres	12	$6,000	$72,000
Excavation	CY	102,000	$5	$510,000
Rip Rap	Ton	5,300	$30	$159,000
2' Clay Liner and compaction	Ton	34,500	$5	$172,500
Pump Station and Force main				
Excavation / Earthwork	CY	600	$25	$15,000
Wet well / valve vault structures	CY	50	$600	$30,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$40,000	$40,000
Piping and Valves	LS	1	$20,000	$20,000
Misc. patches/grout/fillets/cleanup	LS	1	$5,000	$5,000
MCC and electrical	LS	1	$50,000	$50,000
8" PVC SDR 21 forcemain	LF	5300	$25	$132,500
Piping and Valves				
10", PVC SDR 26 Sewer Pipe	LF	1000	$30	$30,000
12", PVC SDR 26 Sewer Pipe	LF	500	$35	$17,500
8", plug valves, box and stem	EA	2	$2,500	$5,000
10", plug valves, box and stem	EA	8	$3,000	$24,000
12", plug valves, box and stem	EA	4	$4,000	$16,000
Telescoping valves	EA	2	$9,000	$18,000
Center Pivot Irrigation System				
Center Pivot System	EA	2	$90,000	$180,000
Diesel Engine Generator	LS	1	$55,000	$55,000
Miscellaneous Items				
Diffused Aeration Equipment	LS	1	$100,000	$100,000
Blowers and Accessories	LS	1	$55,000	$55,000
Groundwater Monitoring Wells	EA	3	$7,000	$21,000
Manholes	EA	4	$2,500	$10,000
Access Covers	EA	4	$1,500	$6,000
Stop Logs	LS	3	$1,500	$4,500
Weir manholes	EA	2	$5,000	$10,000
Sampler	LS	1	$10,000	$10,000
Ultrasonic Level Transducer	EA	2	$4,500	$9,000
Flow Measurement Equipment	EA	1	$12,000	$12,000
Depth Markers	EA	2	$1,000	$2,000
Fencing	LF	8000	$10	$80,000
Soil Borings	LS	1	$15,000	$15,000
Topographic Survey	LS	1	$25,000	$25,000
Electrical & Controls	LS	1	$90,000	$90,000
Permitting	LS	1	$20,000	$20,000
Cost of Land	Acres	25	$5,000	$125,000
Estimated Construction Costs				$2,557,800
Contingency (10% of Construction Costs)				$255,780
Total estimated construction costs				$2,813,580
Engineering (15% of construction costs)				$422,000
Construction Observation (10% of construction costs)				$281,000
Total Estimated Capital Cost				**$3,517,000**

Note: The cost of farmland for final disposal of wastewater is not included in the land cost.

Table 14 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Existing North Airport Road Pump Station

Prepared by Farida S. Goderya

Item	Cost
Pump Station	$388,000
Force Main	$2,615,600
Equalization Basin	$630,000
Odor and Septicity Control	$49,000
Estimated construction costs	$3,682,600
Contingency (10% of Construction Costs)	$368,260
Total Estimated construction costs	$4,051,000
Engineering (15% of construction costs)	$608,000
Construction Observation (10% of construction costs)	$405,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000
Town of Normal Connection Charge (150 acres, $2255/acre)	$338,250
Total Estimated Capital Cost	$5,962,300

Table 14a -- Cost Breakdown

Pump Station

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	1400	$25	$35,000
Wet well / valve vault structures	CY	40	$650	$26,000
Dewatering	DAY	10	$700	$7,000
Control building/super structure	LS	1	$75,000	$75,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$70,000	$70,000
Piping and Valves	LS	1	$35,000	$35,000
Misc. patches/grout/fillets/cleanup	LS	1	$10,000	$10,000
Generator	LS	1	$55,000	$55,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$388,000

Force Main

Item	Unit	Quantity	Unit Cost	Item Cost
8" DIP forcemain	LF	56200	$35	$1,967,000
Roads crossing	LF	300	$350	$105,000
Allowance for tie in into pump station	LS	1	$20,000	$20,000
Air release valve and manholes	EA	25	$6,000	$150,000
Surface Restoration with Seeding and Fertilizer	LF	56200	$3	$168,600
Sidewalk removal and replacement	LF	5000	$30	$150,000
Driveway crossings	LF	1000	$55	$55,000
Total				$2,615,600

Equalization Basin

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	3700	$25	$92,500
Concrete-Basin floor and walls	CY	500	$600	$300,000
Dewatering	DAY	15	$700	$10,500
Aeration and Mixing Equipment	LS	1	$125,000	$125,000
Piping and Valves	LS	1	$40,000	$40,000
Landscaping	ACRE	2	$10,000	$20,000
Cover	SF	6400	$5	$32,000
Miscellaneous	LS	1	$10,000	$10,000
Total				$630,000

Odor and Septicity Control

Item	Unit	Quantity	Unit Cost	Item Cost
Concrete pad and containment structure	CY	30	$600	$18,000
Chemical feed system	LS	1	$15,000	$15,000
Chemical feed storage tank	LS	1	$6,000	$6,000
Chemical feed piping/tubing and valves	LS	1	$5,000	$5,000
Miscellaneous	LS	1	$5,000	$5,000
Total				$49,000

Table 15 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Future Pipeline Road Pump Station

Prepared by Farida S. Goderya

Item	Cost
Pump Station	$388,000
Force Main	$2,532,000
Equalization Basin	$630,000
Odor and Septicity Control	$49,000
Estimated construction costs	$3,599,000
Contingency (10% of Construction Costs)	$359,900
Total Estimated construction costs	$3,959,000
Engineering (15% of construction costs)	$594,000
Construction Observation (10% of construction costs)	$396,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000
Town of Normal Connection Charge (150 acres, $2255/acre)	$338,250
Total Estimated Capital Cost	$5,847,300

Table 15a -- Cost Breakdown

Pump Station

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	1400	$25	$35,000
Wet well / valve vault structures	CY	40	$650	$26,000
Dewatering	DAY	10	$700	$7,000
Control building/super structure	LS	1	$75,000	$75,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$70,000	$70,000
Piping and Valves	LS	1	$35,000	$35,000
Misc. patches/grout/fillets/cleanup	LS	1	$10,000	$10,000
Generator	LS	1	$55,000	$55,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$388,000

Force Main

Item	Unit	Quantity	Unit Cost	Item Cost
8" DIP forcemain	LF	54000	$35	$1,890,000
Roads crossing	LF	300	$350	$105,000
Allowance for tie in into pump station	LS	1	$20,000	$20,000
Air release valve and manholes	EA	25	$6,000	$150,000
Surface Restoration with Seeding and Fertilizer	LF	54000	$3	$162,000
Sidewalk removal and replacement	LF	5000	$30	$150,000
Driveway crossings	LF	1000	$55	$55,000
Total				$2,532,000

Equalization Basin

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	3700	$25	$92,500
Concrete-Basin floor and walls	CY	500	$600	$300,000
Dewatering	DAY	15	$700	$10,500
Aeration and Mixing Equipment	LS	1	$125,000	$125,000
Piping and Valves	LS	1	$40,000	$40,000
Landscaping	ACRE	2	$10,000	$20,000
Cover	SF	6400	$5	$32,000
Miscellaneous	LS	1	$10,000	$10,000
Total				$630,000

Odor and Septicity Control

Item	Unit	Quantity	Unit Cost	Item Cost
Concrete pad and containment structure	CY	30	$600	$18,000
Chemical feed system	LS	1	$15,000	$15,000
Chemical feed storage tank	LS	1	$6,000	$6,000
Chemical feed piping/tubing and valves	LS	1	$5,000	$5,000
Miscellaneous	LS	1	$5,000	$5,000
Total				$49,000

Table 16 -- Lake's Wastewater Transfer from East PS to BNWRD Future Money Creek Pump Station

Prepared by Farida S. Goderya

Item	Cost
Pump Station	$388,000
Force Main	$1,919,000
Equalization Basin	$630,000
Odor and Septicity Control	$49,000
Estimated construction costs	$2,986,000
Contingency (10% of Construction Costs)	$298,600
Total Estimated construction costs	$3,285,000
Engineering (15% of construction costs)	$493,000
Construction Observation (10% of construction costs)	$329,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000
Town of Normal Connection Charge (0 acres, $2255/acre)	$0
Total Estimated Capital Cost	$4,667,000

Table 16a -- Cost Breakdown

Pump Station

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	1400	$25	$35,000
Wet well / valve vault structures	CY	40	$650	$26,000
Dewatering	DAY	10	$700	$7,000
Control building/super structure	LS	1	$75,000	$75,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$70,000	$70,000
Piping and Valves	LS	1	$35,000	$35,000
Misc. patches/grout/fillets/cleanup	LS	1	$10,000	$10,000
Generator	LS	1	$55,000	$55,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$388,000

Force Main

Item	Unit	Quantity	Unit Cost	Item Cost
8" DIP forcemain	LF	40000	$35	$1,400,000
Roads crossing	LF	240	$350	$84,000
Allowance for tie in into pump station	LS	1	$20,000	$20,000
Air release valve and manholes	EA	25	$6,000	$150,000
Surface Restoration with Seeding and Fertilizer	LF	40000	$3	$120,000
Sidewalk removal and replacement	LF	3000	$30	$90,000
Driveway crossings	LF	1000	$55	$55,000
Total				$1,919,000

Equalization Basin

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	3700	$25	$92,500
Concrete-Basin floor and walls	CY	500	$600	$300,000
Dewatering	DAY	15	$700	$10,500
Aeration and Mixing Equipment	LS	1	$125,000	$125,000
Piping and Valves	LS	1	$40,000	$40,000
Landscaping	ACRE	2	$10,000	$20,000
Cover	SF	6400	$5	$32,000
Miscellaneous	LS	1	$10,000	$10,000
Total				$630,000

Odor and Septicity Control

Item	Unit	Quantity	Unit Cost	Item Cost
Concrete pad and containment structure	CY	30	$600	$18,000
Chemical feed system	LS	1	$15,000	$15,000
Chemical feed storage tank	LS	1	$6,000	$6,000
Chemical feed piping/tubing and valves	LS	1	$5,000	$5,000
Miscellaneous	LS	1	$5,000	$5,000
Total				$49,000

Table 17 -- Lake's Wastewater Transfer from West PS to BNWRD Future Six Mile Creek Pump Station

Prepared by Farida S. Goderya

Item	Cost
Pump Station	$388,000
Force Main	$1,831,800
Equalization Basin	$630,000
Odor and Septicity Control	$49,000
Estimated construction costs	$2,898,800
Contingency (10% of Construction Costs)	$289,880
Total Estimated construction costs	$3,189,000
Engineering (15% of construction costs)	$478,000
Construction Observation (10% of construction costs)	$319,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000
Town of Normal Connection Charge (0 acres, $2255/acre)	$0
Total Estimated Capital Cost	$4,546,000

Table 17a -- Cost Breakdown

Pump Station

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	1400	$25	$35,000
Wet well / valve vault structures	CY	40	$650	$26,000
Dewatering	DAY	10	$700	$7,000
Control building/super structure	LS	1	$75,000	$75,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$70,000	$70,000
Piping and Valves	LS	1	$35,000	$35,000
Misc. patches/grout/fillets/cleanup	LS	1	$10,000	$10,000
Generator	LS	1	$55,000	$55,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$388,000

Force Main

Item	Unit	Quantity	Unit Cost	Item Cost
8" DIP forcemain	LF	38100	$35	$1,333,500
Roads crossing	LF	240	$350	$84,000
Allowance for tie in into pump station	LS	1	$20,000	$20,000
Air release valve and manholes	EA	25	$6,000	$150,000
Surface Restoration with Seeding and Fertilizer	LF	38100	$3	$114,300
Sidewalk removal and replacement	LF	2500	$30	$75,000
Driveway crossings	LF	1000	$55	$55,000
Total				$1,831,800

Equalization Basin

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	3700	$25	$92,500
Concrete-Basin floor and walls	CY	500	$600	$300,000
Dewatering	DAY	15	$700	$10,500
Aeration and Mixing Equipment	LS	1	$125,000	$125,000
Piping and Valves	LS	1	$40,000	$40,000
Landscaping	ACRE	2	$10,000	$20,000
Cover	SF	6400	$5	$32,000
Miscellaneous	LS	1	$10,000	$10,000
Total				$630,000

Odor and Septicity Control

Item	Unit	Quantity	Unit Cost	Item Cost
Concrete pad and containment structure	CY	30	$600	$18,000
Chemical feed system	LS	1	$15,000	$15,000
Chemical feed storage tank	LS	1	$6,000	$6,000
Chemical feed piping/tubing and valves	LS	1	$5,000	$5,000
Miscellaneous	LS	1	$5,000	$5,000
Total				$49,000

Table 18 -- Lake's Wastewater Transfer from East PS to BNWRD Future Six Mile Creek Pump Station Together with Lexington Wastewater Transfer

Prepared by Farida S. Goderya

Item	Cost
Pump Station	$388,000
Force Main	$272,500
Equalization Basin	$630,000
Odor and Septicity Control	$49,000
COB-LB Share in Combined Pump Station (1/3 of Total Cost)	$195,500
COB-LB Share in Combined Force Main (1/3 of Total Cost)	$1,337,667
Estimated construction costs	$2,872,667
Contingency (10% of Construction Costs)	$287,267
Total Estimated construction costs	$3,160,000
Engineering (15% of construction costs)	$474,000
Construction Observation (10% of construction costs)	$316,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000
Town of Normal Connection Charge (0 acres, $2255/acre)	$0
Total Estimated Capital Cost	$4,510,000

Table 18a -- Cost Breakdown

Pump Station

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	1400	$25	$35,000
Wet well / valve vault structures	CY	40	$650	$26,000
Dewatering	DAY	10	$700	$7,000
Control building/super structure	LS	1	$75,000	$75,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$70,000	$70,000
Piping and Valves	LS	1	$35,000	$35,000
Misc. patches/grout/fillets/cleanup	LS	1	$10,000	$10,000
Generator	LS	1	$55,000	$55,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$388,000

Force Main

Item	Unit	Quantity	Unit Cost	Item Cost
8" DIP forcemain	LF	5500	$35	$192,500
Roads crossing	LF	60	$350	$21,000
Allowance for tie in into pump station	LS	1	$10,000	$10,000
Air release valve and manholes	EA	2	$6,000	$12,000
Surface Restoration with Seeding and Fertilizer	LF	5500	$3	$16,500
Sidewalk removal and replacement	LF	500	$30	$15,000
Driveway crossings	LF	100	$55	$5,500
Total				$272,500

Equalization Basin

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	3700	$25	$92,500
Concrete-Basin floor and walls	CY	500	$600	$300,000
Dewatering	DAY	15	$700	$10,500
Aeration and Mixing Equipment	LS	1	$125,000	$125,000
Piping and Valves	LS	1	$40,000	$40,000
Landscaping	ACRE	2	$10,000	$20,000
Cover	SF	6400	$5	$32,000
Miscellaneous	LS	1	$10,000	$10,000
Total				$630,000

Odor and Septicity Control

Item	Unit	Quantity	Unit Cost	Item Cost
Concrete pad and containment structure	CY	30	$600	$18,000
Chemical feed system	LS	1	$15,000	$15,000
Chemical feed storage tank	LS	1	$6,000	$6,000
Chemical feed piping/tubing and valves	LS	1	$5,000	$5,000
Miscellaneous	LS	1	$5,000	$5,000
Total				$49,000

Combined Pump Station for COB-Lake Bloomington and Lexington WW

Item	Unit	Quantity	Unit Cost	Item Cost
Excavation / Earthwork	CY	900	$25	$22,500
Wet well / valve vault structures	CY	150	$600	$90,000
Dewatering	DAY	20	$700	$14,000
Control building/super structure	LS	1	$90,000	$90,000
Pumps, floats, level control, cables, rail, base elbows	LS	1	$115,000	$115,000
Piping and Valves	LS	1	$75,000	$75,000
Misc. patches/grout/fillets/cleanup	LS	1	$20,000	$20,000
Generator	LS	1	$85,000	$85,000
MCC, VFD, and electrical costs	LS	1	$75,000	$75,000
Total				$586,500

Combined Force Main For COB-Lake Bloomington and Lexington WW

Item	Unit	Quantity	Unit Cost	Item Cost
14" DIP forcemain	LF	56000	$60	$3,360,000
Roads crossing	LF	400	$350	$140,000
Allowance for tie in into pump station	LS	1	$20,000	$20,000
Air release valve and manholes	EA	30	$7,000	$210,000
Surface Restoration with Seeding and Fertilizer	LF	56000	$3	$168,000
Sidewalk removal and replacement	LF	2000	$30	$60,000
Driveway crossings	LF	1000	$55	$55,000
Total				$4,013,000

Table 19 -- Outfall Sewer Pipe Cost Estimates

Prepared by Farida S. Goderya

Item	Unit	Quantity	Unit Cost	Total
10" SDR 26 Outfall Sewer	LF	2500	$30	$75,000
Manholes @ 400' distance	EA	8	$2,800	$22,400
Road crossings	LF	60	$200	$12,000
Seeding, fertilizing	LF	2500	$3	$7,500
Miscellaneous	LF	1	$5,000	$5,000
Estimated Construction Costs				$121,900
Contingency (10% of Construction Costs)				$12,190
Total estimated construction costs				$134,090
Engineering (15% of construction costs)				$20,000
Construction Observation (10% of construction costs)				$13,000
Total Estimated Capital Cost				**$167,000**

Table 20a -- Non - Aerated Lagoon WWTP - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Generator Set	$750
WWTP Daily Site Visits and Sampling (8hr/wk, $40/hr)	$16,640
WWTP Grounds Upkeep (6 hr/wk, $30/hr)	$9,360
Outfall Pipe (1% of Construction Costs)	$1,341
NPDES Fee	$5,000
Sewage Collection System (1% of Construction Costs)	$51,076
Annual Operating and Maintenance Costs	**$89,518**

Table 20b -- Aerated Lagoon WWTP - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Generator Set	$750
WWTP Daily Site Visits and Sampling (8hr/wk, $40/hr)	$16,640
WWTP, Aeration Equipment Power (40 hp, 16 hr, 0.10/kw-hr)	$17,403
WWTP Grounds Upkeep (6 hr/wk, $30/hr)	$9,360
Outfall Pipe (1% of Construction Costs)	$1,341
NPDES Fee	$5,000
Sewage Collection System (1% of Construction Costs)	$51,076
Annual Operating and Maintenance Costs	**$106,921**

Table 20c -- Covered Lagoon WWTP - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Generator Set	$750
Lagoon Covers General Upkeep (3 hr/wk, $40/hr)	$6,240
WWTP Daily Site Visits and Sampling (8hr/wk, $40/hr)	$16,640
WWTP, Aeration Equipment Power (40 hp, 16 hr, 0.10/kw-hr)	$17,403
Sludge Cleaning (needed every 8-10 years)	$8,000
Polishing Reactor Modules Cleaning	$5,000
WWTP Grounds Upkeep (8 hr/wk, $30/hr)	$12,480
Outfall Pipe (1% of Construction Costs)	$1,341
NPDES Fee	$5,000
Sewage Collection System (1% of Construction Costs)	$51,076
Annual Operating and Maintenance Costs	**$129,281**

Table 20d -- Land Application System - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Generator Set	$750
WWTP Site Visits and Sampling (8hr/d, 1d/wk, $40/hr)	$16,640
WWTP, Aeration Equipment Power (40 hp, 16 hr, 0.10/kw-hr)	$17,403
WWTP Grounds Upkeep (6 hr/wk, $30/hr)	$9,360
GW Monitoring & Irrigation System Upkeep (8 hr/wk, $40/hr, 52 weeks)	$16,640
Sewage Collection System (1% of Construction Costs)	$51,076
Annual Operating and Maintenance Costs	**$117,220**

Table 20e -- Mechanical WWTP - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Bar Screen and Influent Channel	$1,400
Grit Chamber and Equipment	$1,200
Primary Clarifiers	$2,750
Trickling Filters	$4,500
Final Clarifiers	$3,000
Sludge Pump Station	$4,500
Aerobic Digesters	$7,650
Blowers and Building	$8,800
Sludge Dewatering, Pumps, Filter Press	$14,000
Sludge drying/Storage (20hr/wk, $40/hr, 16 wk)	$12,800
Tertiary Filters	$3,800
Disinfection	$3,000
Generator Set	$1,000
Electrical/Controls and Misc. Power	$4,000
WWTP Superintendent	$40,000
Misc. Labor / Material (8 hr/wk, $35/hr)	$14,560
Outfall Pipe (1% of Construction Costs)	$1,341
NPDES and Sludge Application Fee	$7,500
Sewage Collection System (1% of Construction Costs)	$51,076
Annual Operating and Maintenance Costs	**$192,228**

Table 20f -- Orenco Recirculating Sand Filter WWTP - Annual Operating & Maintenance and Replacement Co

Prepared by Farida S. Goderya

Item	Cost
Influent Pump Station Power (20 Hp, 8 hr, $0.10/kw-hr)	$4,351
Force Main	$1,000
Generator Set	$750
WWTP Site Visits, Upkeep and Sampling (16hr/wk, $30/hr)	$24,960
WWTP, Equipment Power (20 hp, 12 hr, 0.10/kw-hr)	$6,526
Sand Media Replacement (needed every 10 years)	$8,000
Outfall Pipe (1% of Construction Costs)	$1,341
NPDES Fee	$5,000
STEP Sewer Collection System (1% of Construction Costs)	$53,991
Septic Tanks Cleaning & Maintenance (200 per yr, $250/ea)	$50,000
Annual Operating and Maintenance Costs	**$155,919**

Table 21 -- Wastewater Transfer - Annual Operating & Maintenance and Replacement Costs

Prepared by Farida S. Goderya

Item	Table 14 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Existing North Airport Road Pump Station	Table 15 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Future Pipeline Road Pump Station	Table 16 -- Lake's Wastewater Transfer from East PS to BNWRD Future Money Creek Pump Station	Table 17 -- Lake's Wastewater Transfer from West PS to BNWRD Future Six Mile Creek Pump Station	Table 18 -- Lake's Wastewater Transfer from East PS to BNWRD Future Six Mile Creek Pump Station Together with Lexington Wastewater Transfer
Pump Station	$5,820	$5,820	$5,820	$5,820	$5,820
Force Main	$15,693.60	$15,192	$11,514	$10,991	$1,635
Equalization Basin	$15,120	$15,120	$15,120	$15,120	$15,120
Odor and Septicity Control (8.5 gal/day, $1.5/gal, 365 days)	$4,654	$4,654	$4,654	$4,654	$4,654
COB-Lake Bloomington Share in Combined Pump Station (1/3 of Total Cost)					$2,346
COB-Lake Bloomington Share in Combined Force Main (/3 of Total Cost)					$5,351
Generator	$1,500	$1,500	$1,500	$1,500	$1,500
Site Superintendent / Material (8 hr/wk, $40/hr)	$16,640	$16,640	$16,640	$16,640	$16,640
Sewage Collection System (1.0% of Construction Costs)	$51,076	$51,076	$51,076	$51,076	$51,076
Annual Operating and Maintenance Costs	**$110,504**	**$110,002**	**$106,324**	**$105,801**	**$104,142**

Table 22 -- Summary and Comparison of Various Treatment Alternatives

Prepared by Farida S. Goderya

	Non-Aerated Lagoon	Aerated Lagoon	Covered Lagoon	Lagoon W/ Land	Mechanical WWTP	Orenco RSF
Interest rate, %	2.50	2.50	2.50	2.50	2.50	2.50
Term, years	20	20	20	20	20	20
Amortization factor	0.0641	0.0641	0.0641	0.0641	0.0641	0.0641
Number of Households	400	400	400	400	400	400
Construction Cost of Influent Pump Station and Force main	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000
Construction Cost of WWTP	$2,710,100	$2,057,250	$2,067,750	$2,557,800	$3,925,000	$1,807,500
Construction Cost of Outfall Pipe	$121,900	$121,900	$121,900	$121,900	$121,900	$121,900
Estimated construction costs	$3,126,000	$2,473,200	$2,483,700	$2,973,700	$4,340,900	$2,223,400
Contingency (10% of Construction Costs)	$312,600	$247,320	$248,370	$297,370	$434,090	$222,340
Total Estimated Construction costs for WW Treatment System	$3,439,000	$2,721,000	$2,732,000	$3,271,000	$4,775,000	$2,446,000
Engineering (15% of construction costs)	$516,000	$408,000	$410,000	$491,000	$716,000	$367,000
Construction Observation (10% of construction costs)	$344,000	$272,000	$273,000	$327,000	$478,000	$245,000
Wastewater Treatment System Capital Cost	$4,299,000	$3,401,000	$3,415,000	$4,089,000	$5,969,000	$3,058,000
Sewage Collection System Capital Costs	$6,385,000	$6,385,000	$6,385,000	$6,385,000	$6,385,000	$6,749,000
Annual Cost of WW Treatment System	$275,769	$218,164	$219,062	$262,298	$382,894	$196,162
Annual Cost of Sewage Collection System	$409,579	$409,579	$409,579	$409,579	$409,579	$432,929
Annual Operating, Maintenance and Replacement Costs	$89,518	$106,921	$129,281	$117,220	$192,228	$155,919
Annual Revenue Required	$ 774,866	$ 734,665	$ 757,923	$ 789,097	$ 984,702	$ 785,010
Annual Cost Per Customer	$ 1,937.2	$ 1,836.7	$ 1,894.8	$ 1,972.7	$ 2,461.8	$ 1,962.5
Monthly Cost Per Customer	**$ 161.43**	**$ 153.06**	**$ 157.90**	**$ 164.40**	**$ 205.15**	**$ 163.54**

Notes:
The interest rate used here is the one established by Illinois EPA for 8/2003 to 7/2004.
Existing number of Households were calculated by counting all the residences with a permanent address.

Table 23 -- Summary and Comparison of Wastewater Transfer Options

Prepared by Farida S. Godeiya

Interest Rate, %	2.50	2.50	2.50	2.50	2.50
Term, Years	20	20	20	20	20
Amortization Factor	0.0641	0.0641	0.0641	0.0641	0.0641
Number of Households	400	400	400	400	400

Item	Table 14 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Existing North Airport Road Pump	Table 15 -- Lake's Wastewater Transfer from East PS to the Town of Normal (TON) Future Pipeline Road Pump	Table 16 -- Lake's Wastewater Transfer from East PS to BNWRD Future Money Creek Pump Station	Table 17 -- Lake's Wastewater Transfer from West PS to BNWRD Future Six Mile Creek Pump Station	Table 18 -- Lake's Wastewater Transfer from East PS to BNWRD Future Six Mile Creek Pump Station Together with Lexington Wastewater Transfer
Pump Station	$388,000	$388,000	$388,000	$388,000	$388,000
Force Main	$2,615,600	$2,532,000	$1,919,000	$1,831,800	$272,500
Equalization Basin	$630,000	$630,000	$630,000	$630,000	$630,000
Odor and Septicity Control	$49,000	$49,000	$49,000	$49,000	$49,000
COB-Lake Bloomington Share in Combined Pump Station (1/3 of Total)					$195,500
COB-Lake Bloomington Share in Combined Force Main (1/3 of Total)					$1,337,667
Estimated construction costs	$3,682,600	$3,599,000	$2,986,000	$2,898,800	$2,872,667
Contingency (10% of Construction Costs)	$368,260	$359,900	$298,600	$289,880	$287,267
Total Estimated construction costs for WW Transfer System	$4,051,000	$3,959,000	$3,285,000	$3,189,000	$3,160,000
Engineering (15% of construction costs)	$608,000	$594,000	$493,000	$478,000	$474,000
Construction Observation (10% of construction costs)	$405,000	$396,000	$329,000	$319,000	$316,000
BNWRD Connection Charge (400 Customers, $1400/Customer)	$560,000	$560,000	$560,000	$560,000	$560,000
Town of Normal Connection Charge	$338,250	$338,250	$0	$0	$0
Capital Costs of Wastewater Transfer System	$5,962,300	$5,847,300	$4,667,000	$4,546,000	$4,510,000
Capital Costs of Sewage Collection System	$6,385,000	$6,385,000	$6,385,000	$6,385,000	$6,385,000
Annual Cost of Wastewater Transfer System	$382,464	$375,088	$299,375	$291,613	$289,304
Annual Cost of Sewage Collection System	$409,579	$409,579	$409,579	$409,579	$409,579
Annual Operating, Maintenance and Replacement Costs	$110,504	$110,002	$106,324	$105,801	$104,142
Total Annual Revenue Required	**$ 902,547**	**$ 894,669**	**$ 815,278**	**$ 806,993**	**$ 803,025**
Annual Cost Per Customer	$ 2,256.4	$ 2,236.7	$ 2,038.2	$ 2,017.5	$ 2,007.6
BNWRD Monthly User Charge Per Customer	$ 4.35	$ 4.35	$ 4.35	$ 4.35	$ 4.35
Town of Normal Monthly User Charge Per Customer	$ 3.01	$ 3.01	$ -	$ -	$ -
Monthly Cost Per Customer	**$ 195.39**	**$ 193.75**	**$ 174.20**	**$ 172.47**	**$ 171.65**

Notes:

The interest rate used here is the one established by Illinois EPA for 8/2003 to 7/2004.

Existing number of Households were calculated by counting all the residences with a permanent address.

BNWRD monthly charges are $0.87/1000 gallons and 5000 gallons usage per month per household

Town of Normal charges (per Two Months): $2.00 for first 4,700 gallons, consumption in excess @ 0.77 per 1000 gallons per Household

Table 24 -- User Charge for Aerated Lagoon WWTP (with Various Grant/Loan Options)

Prepared by Farida S. Goderya

Interest rate, %	2.50	2.50	2.50	2.50
Term, years	20	20	20	20
Amortization factor	0.0641	0.0641	0.0641	0.0641
Number of Households	400	400	400	400

	All Improvements @ 100% IEPA Loan	**All Improvements @ 70% IEPA Loan**	**All Improvements @ 50% IEPA Loan**	**All Improvements @ 30% IEPA Loan**
Capital Cost of Wastewater Treatment System	$3,401,000	$3,401,000	$3,401,000	$3,401,000
Capital Cost of Sewage Collection System	$6,385,000	$6,385,000	$6,385,000	$6,385,000
Total Capital Costs	$ 9,786,000	$ 9,786,000	$ 9,786,000	$ 9,786,000
Loan Eligible Capital Cost	$ 9,786,000	$ 6,850,200	$ 4,893,000	$ 2,935,800
Annual Cost of Loan Eligible Capital Costs	$ 627,744	$ 439,421	$ 313,872	$ 188,323
Annual Operating, Maintenance and Replacement Costs	$106,921	$106,921	$106,921	$106,921
Annual Revenue Required	$ 734,665	$ 546,342	$ 420,793	$ 295,244
Annual Cost Per Customer	$ 1,836.7	$ 1,365.9	$ 1,052.0	$ 738.1
Monthly Cost Per Customer	**$ 153.06**	**$ 113.82**	**$ 87.67**	**$ 61.51**

Notes:
The interest rate used here is the one established by Illinois EPA for 8/2003 to 7/2004.
Existing number of Households were calculated by counting all the residences with a permanent address.

Table 25 -- User Charge for Covered Aerated Lagoon WWTP (with Various Grant/Loan Options)

Prepared by Farida S. Goderya

Interest rate, %	2.50	2.50	2.50	2.50
Term, years	20	20	20	20
Amortization factor	0.0641	0.0641	0.0641	0.0641
Number of Households	400	400	400	400

	All Improvements @ 100% IEPA Loan	**All Improvements @ 70% IEPA Loan**	**All Improvements @ 50% IEPA Loan**	**All Improvements @ 30% IEPA Loan**
Capital Cost of Wastewater Treatment System	$3,415,000	$3,415,000	$3,415,000	$3,415,000
Capital Cost of Sewage Collection System	$6,385,000	$6,385,000	$6,385,000	$6,385,000
Total Capital Costs	$ 9,800,000	$ 9,800,000	$ 9,800,000	$ 9,800,000
Loan Eligible Capital Cost	$ 9,800,000	$ 6,860,000	$ 4,900,000	$ 2,940,000
Annual Cost of Loan Eligible Capital Costs	$ 628,642	$ 440,049	$ 314,321	$ 188,593
Annual Operating, Maintenance and Replacement Costs	$129,281	$129,281	$129,281	$129,281
Annual Revenue Required	$ 757,923	$ 569,331	$ 443,602	$ 317,874
Annual Cost Per Customer	$ 1,894.8	$ 1,423.3	$ 1,109.0	$ 794.7
Monthly Cost Per Customer	**$ 157.90**	**$ 118.61**	**$ 92.42**	**$ 66.22**

Notes:
The interest rate used here is the one established by Illinois EPA for 8/2003 to 7/2004.
Existing number of Households were calculated by counting all the residences with a permanent address.

Table 26 -- User Charge for Lake's WW Transfer from West PS to BNWRD Six Mile Creek PS (with Various Grant/Loan Options)

Prepared by Farida S. Goderya

Interest rate, %	2.50	2.50	2.50	2.50
Term, years	20	20	20	20
Amortization factor	0.0641	0.0641	0.0641	0.0641
Number of Households	400	400	400	400

	All Improvements @ 100% IEPA Loan	All Improvements @ 70% IEPA Loan	All Improvements @ 50% IEPA Loan	All Improvements @ 30% IEPA Loan
Capital Cost of Wastewater Transfer System	$4,546,000	$4,546,000	$4,546,000	$4,546,000
Capital Cost of Sewage Collection System	$6,385,000	$6,385,000	$6,385,000	$6,385,000
Total Capital Costs	$ 10,931,000	$ 10,931,000	$ 10,931,000	$ 10,931,000
Loan Eligible Capital Cost	$ 10,931,000	$ 7,651,700	$ 5,465,500	$ 3,279,300
Annual Cost of Loan Eligible Capital Costs	$ 701,192	$ 490,835	$ 350,596	$ 210,358
Annual Operating, Maintenance and Replacement Costs	$105,801	$105,801	$105,801	$105,801
Annual Revenue Required	$ 806,993	$ 596,635	$ 456,397	$ 316,159
Annual Cost Per Customer	$ 2,017.5	$ 1,491.6	$ 1,141.0	$ 790.4
BNWRD Monthly User Charge Per Customer	$ 4.35	$ 4.35	$ 4.35	$ 4.35
Town of Normal Monthly User Charge Per Customer	$ -	$ -	$ -	$ -
Monthly Cost Per Customer	**$ 172.47**	**$ 128.65**	**$ 99.43**	**$ 70.22**

Notes:
The interest rate used here is the one established by Illinois EPA for 8/2003 to 7/2004.
Existing number of Households were calculated by counting all the residences with a permanent address.

Figures

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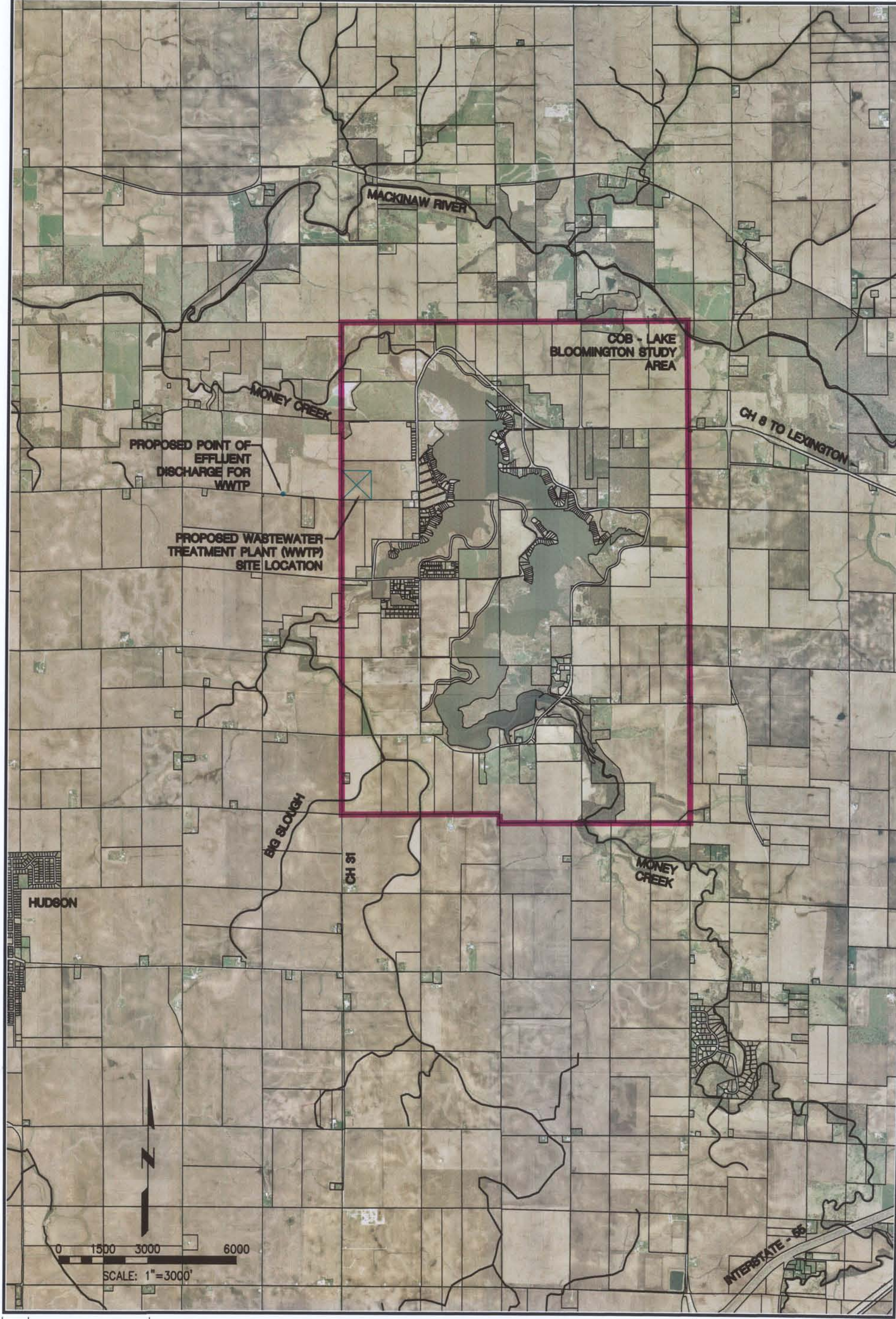

Project No:	102288.1
Book No:	
Drawn by:	CG
Approved:	FSG
Date:	12-8-2003

Fig. 1

City of Bloomington Lake Bloomington, Illinois

Wastewater Collection and Treatment System Facility Plan
Map of the Lake and Surrounding Areas

Farnsworth GROUP
2709 McGraw Drive
BLOOMINGTON, ILLINOIS 61704
(309) 663-8435 / (309) 663-1571 Fax

Revisions
Date: Initials:

ENGINEERS ARCHITECTS SURVEYORS SCIENTISTS
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(309) 663-8435 / (309) 663-1571 Fax
www.f-w.com

Drawn: CG Date: 9-29-2003
Checked: FSG Book No.: -

City of Bloomington, Illinois
Lake Bloomington
Wastewater Collection & Treatment System Facility Plan

VACUUM SEWER COLLECTION SYSTEM

Sheet No.: 2 OF -
Project No.: 102288.1 File No.: -

Revisions
\# Date: Initials:

ENGINEERS ARCHITECTS SURVEYORS SCIENTISTS
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Drawn: NDH Date: 9-29-2003
Checked: FSG Book No.: -

City of Bloomington, Illinois
Lake Bloomington
Wastewater Collection & Treatment System Facility Plan

PRESSURE SEWER COLLECTION SYSTEM

Sheet No.: 3 OF -
Project No.: 102288.1 File No.: -

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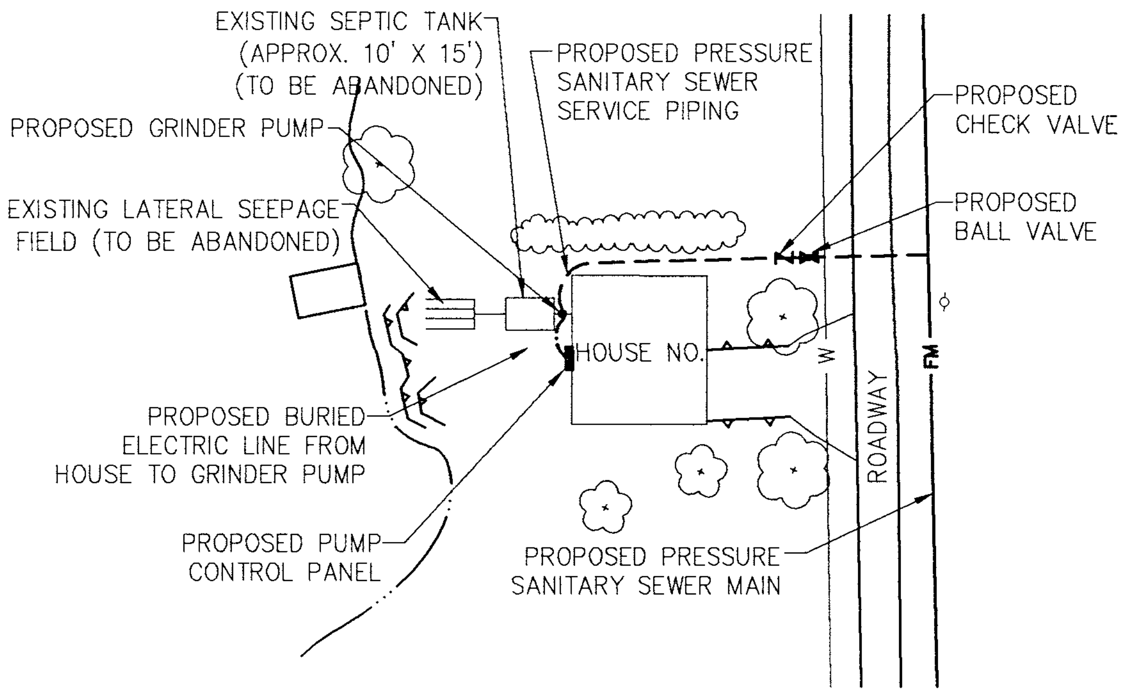
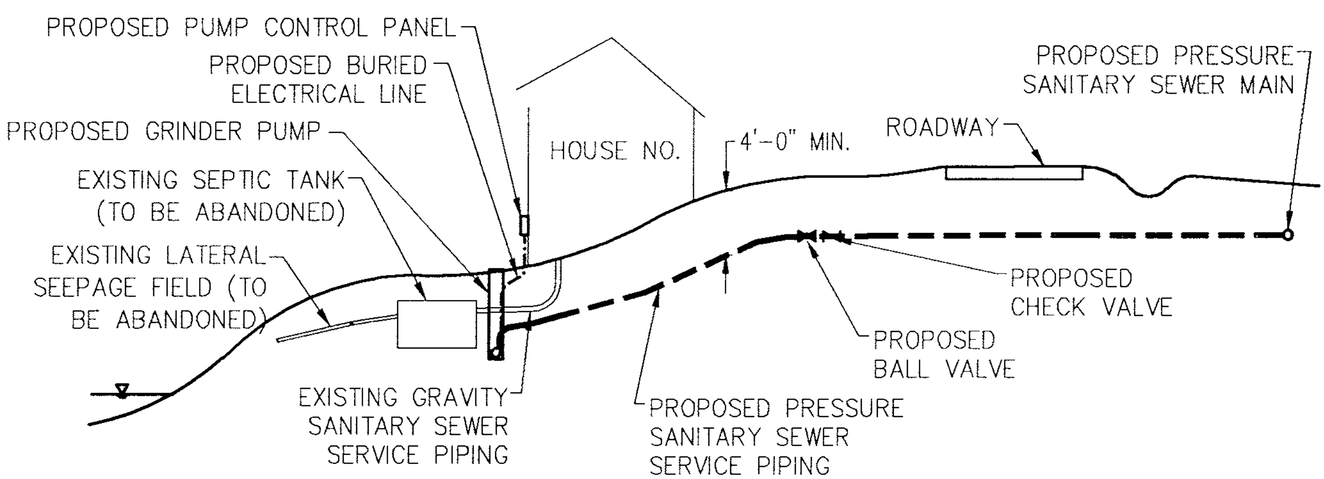


PLAN VIEW

Scale: N.T.S



SECTION VIEW

Scale: N.T.S

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City of Bloomington Lake Bloomington, Illinois
Wastewater Collection & Treatment System Facility Plan

Typical House Service Connection To Pressure Sewer System

Project No: 102288.1
Book No:
Drawn by: CG
Approved: FSG
Date: 12-8-2003

Fig. 4

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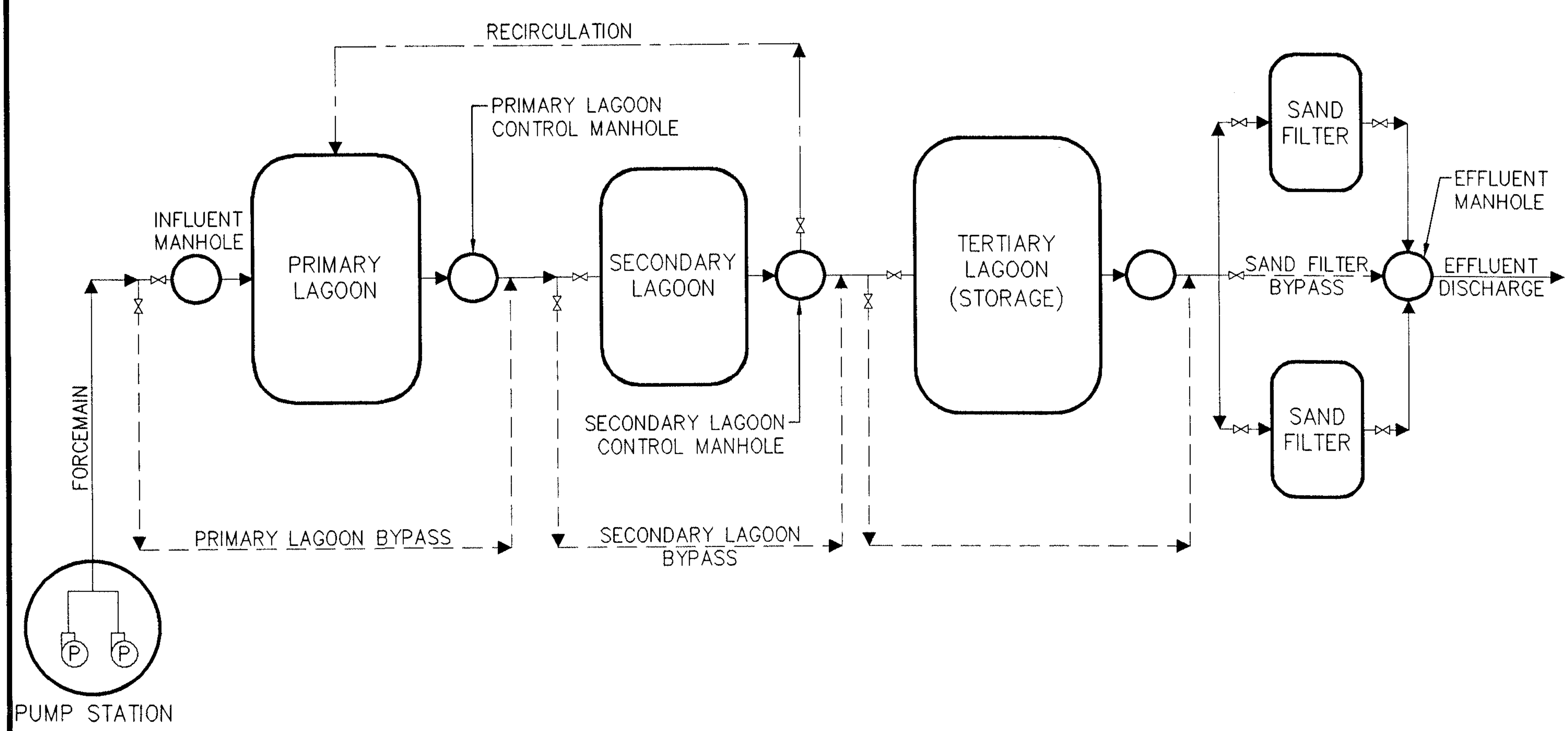

Project No:	102288.1
Book No:	
Drawn by:	CG
Approved:	FSG
Date:	9-5-2003

Fig. 5

City of Bloomington Lake Bloomington, Illinois

Wastewater Collection and Treatment System Facility Plan
Lagoon WWTP Flow Schematic

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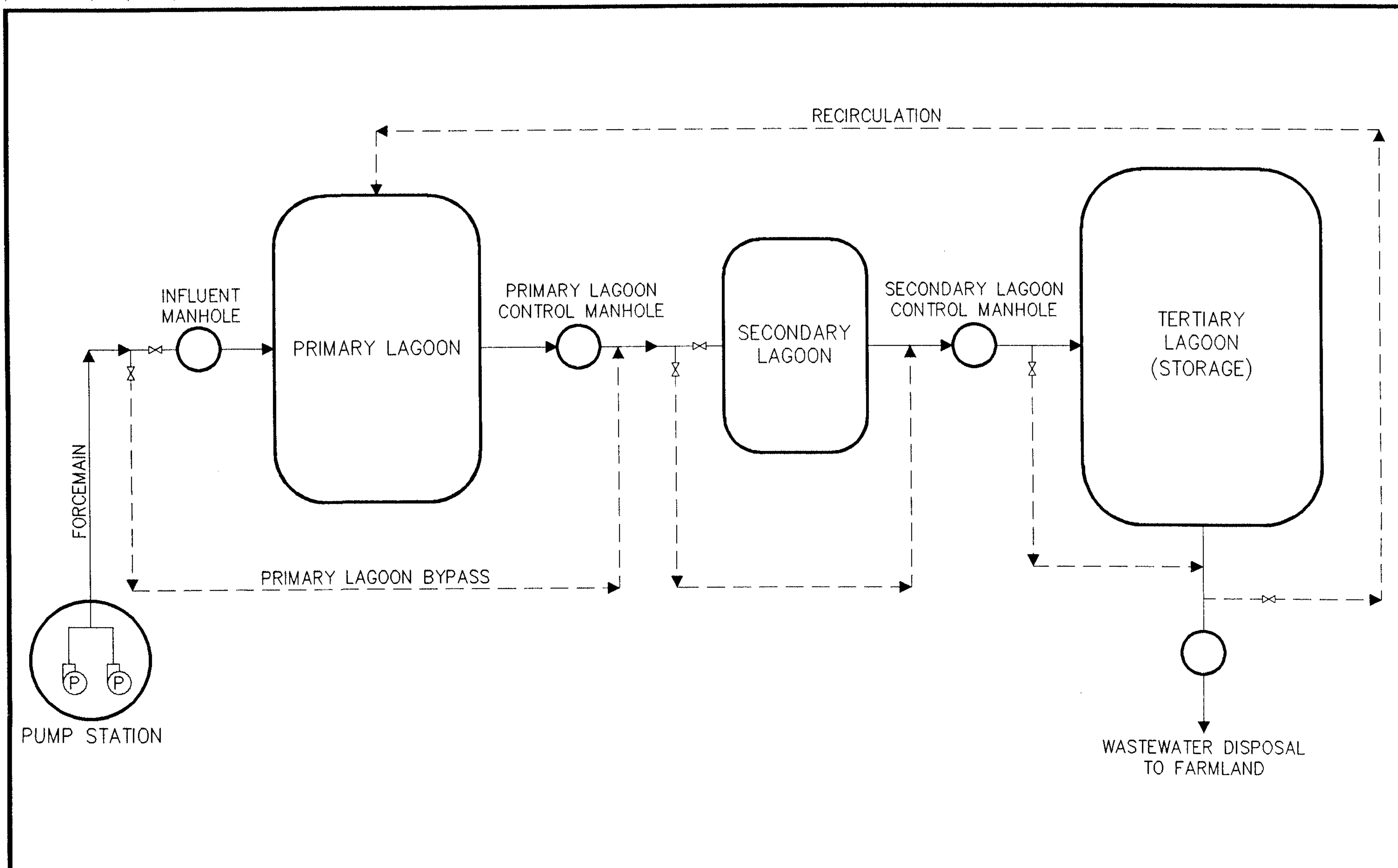

Project No:	102288.1
Book No:	
Drawn by:	CG
Approved:	FSG
Date:	9-5-2003

Fig. 6

City of Bloomington Lake Bloomington, Illinois

Wastewater Collection and Treatment System Facility Plan
Lagoon Treatment with Land Application System Flow Schematic

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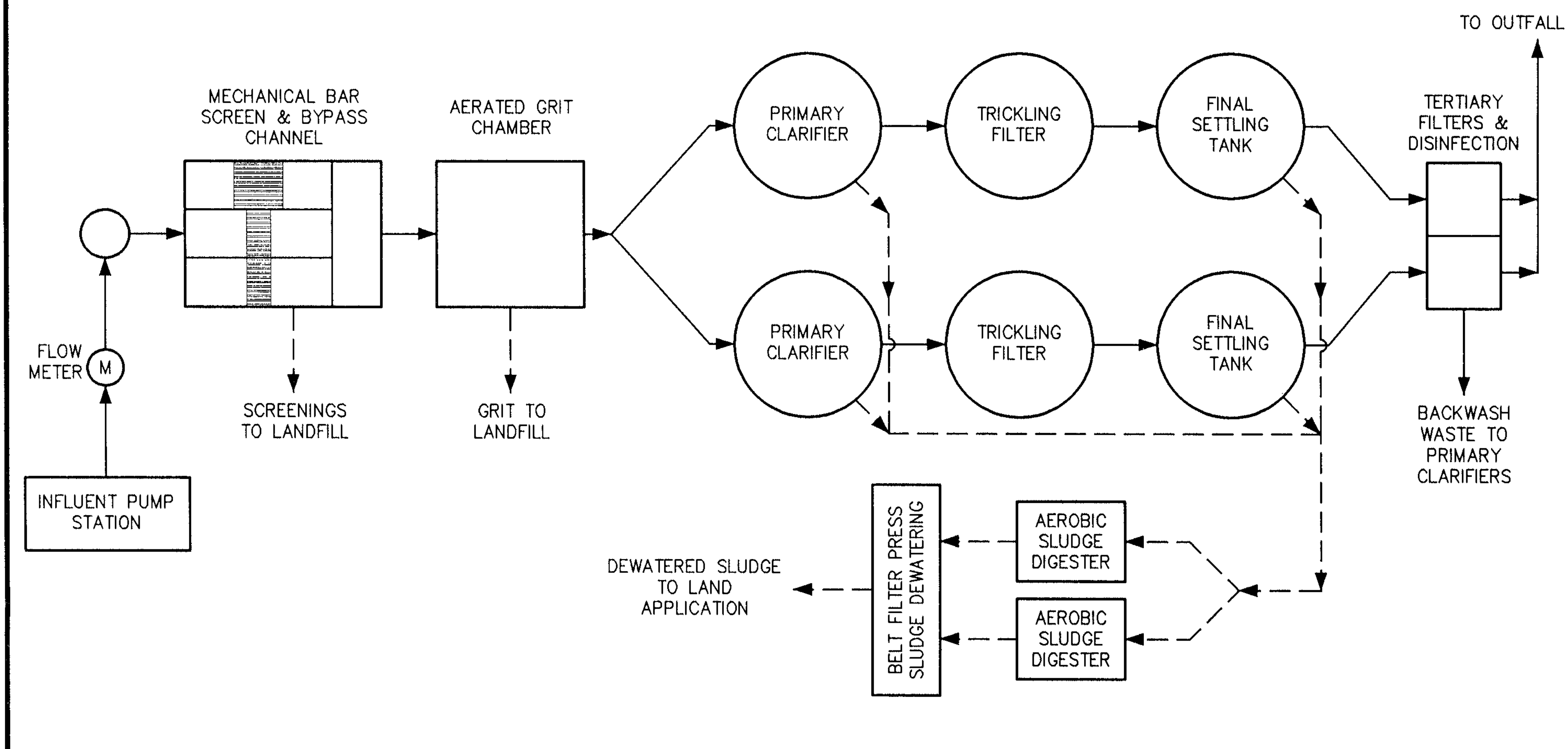

Fig. 7	Project No:	102288.1
	Book No:	
	Drawn by:	CG
	Approved:	FSG
	Date:	9-5-2003

City of Bloomington Lake Bloomington, Illinois

Wastewater Collection and Treatment System Facility Plan
Trickling Filter WWTP Flow Schematic

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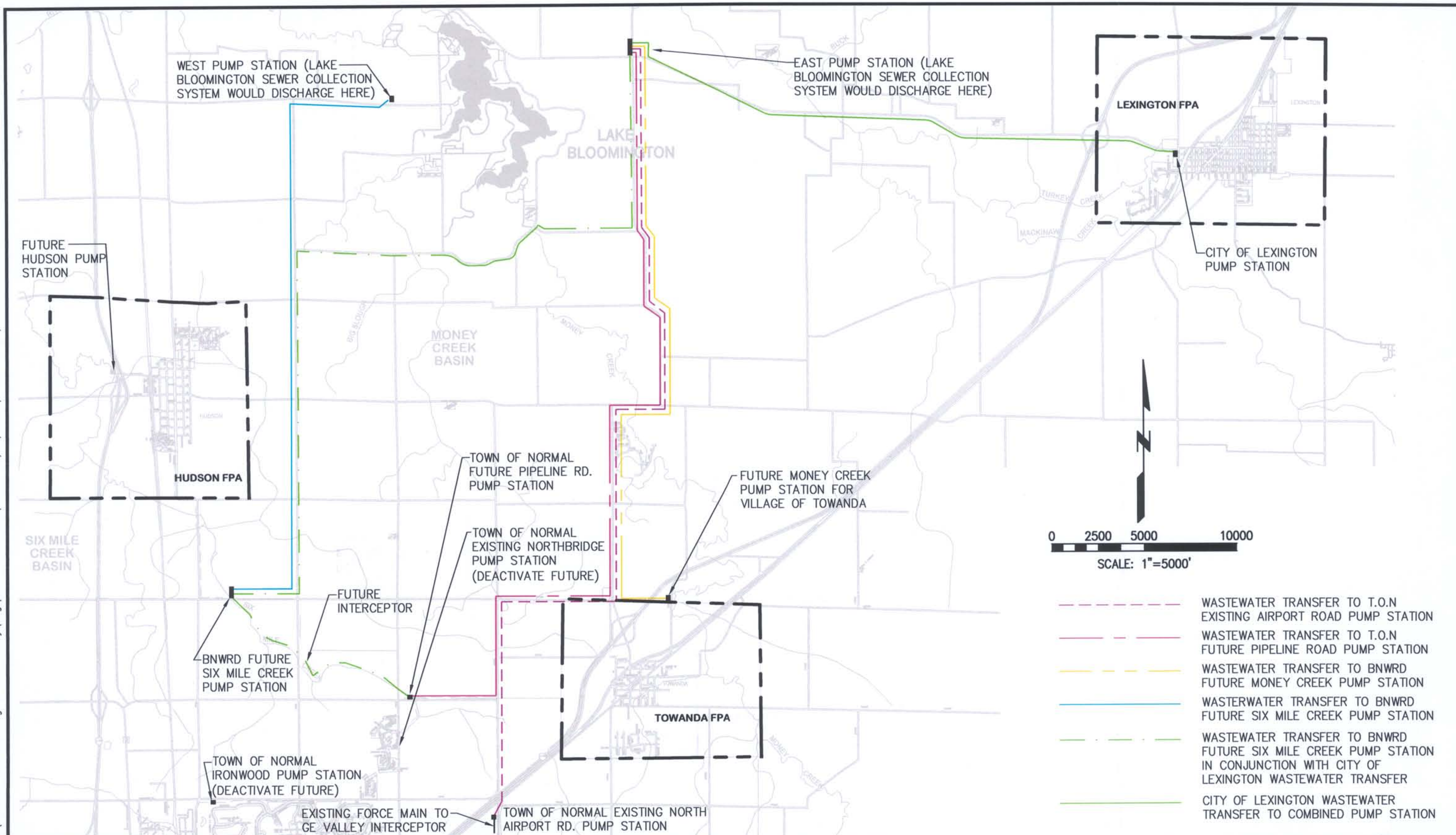

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BLOOMINGTON, ILLINOIS 61704
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City of Bloomington Lake Bloomington, Illinois

Waterwater Treatment System Facility Plan
Map Showing Various Options for C.O.B. Lake Bloomington Wastewater Transfer to BNWRD

Project No:	102288.1
Book No:	
Drawn by:	NDH
Approved:	FSG
Date:	9-5-2003

Figure 8

Appendix A

City of Bloomington – Lake Bloomington, Illinois
Preliminary Basis of Design

Design Assumption / Criteria:

IEPA Average Flow Recommendations	= 100 gpcd
Ratio of Peak Flow to Daily Average Flow	= 4.0
BOD load	= 0.22 lbs./day/PE (240 mg/l)
Influent Suspended Solids (SS) Loading	= 0.25 lbs./day/PE (300 mg/l)
Influent NH3 Loading	= 0.025 lbs./day/PE (30 mg/l)
Conversion factor for BOD oxygen Requirement	= 1.5
Conversion factor for NH3 oxygen Requirement	= 4.6
AOR / SOR, oxygen rate conversion factor	= 0.50
Design Population	2050 Population Equivalents

Flows:

Design Average Flow (DAF) (2050 PE * 100 gpcd)	0.205 MGD
Dry Weather Flow (DWF) (2050 PE * 80 gpcd)	0.164 MGD
Design Maximum Flow (DMF) (4.0 * DAF)	0.82 MGD
Design Sand Filter Flow Rate (12/9 * DAF)	0.274MGD
Total Annual Flow	74.83 MG

Organic Loading:

Influent BOD loading (2050 PE * 0.22 lbs./day/capita)	451 lbs./day
Influent Suspended Solids (SS) loading	513 lbs./day
Influent Ammonia loading	51.3 lbs./day
BOD to Second Stage Lagoon	113 lbs./day
Ammonia to Second Stage Lagoon	13.0 lbs./day

Possible Effluent Requirements (Without Lagoon Exemption):

	Daily Maximum	Monthly Average	Weekly Average
$CBOD_5$ (mg/L)	20	10	
TSS (mg/L)	24	12	
Ammonia (mg/l)			
Spring/Fall	6.8 (N/A)	1.7 (N/A)	4.3
Summer	12.1 (4.8)	1.9 (1.5)	4.8
Winter	8.6 (7.2)	4.0 (2.0)	N/A
pH	Range of 6 to 9 Standard Units		
Total Residual Chlorine (mg/l)	0.05**	--	
Fecal Coliform	400 **	--	

Influent Pump Station:

Flow or Capacity	570 gpm

Non - Aerated Lagoon System

Non - Aerated Primary Lagoon:

IEPA Criteria for BOD Loading	26 lbs. BOD/acre-day
Total Applied BOD	451 lbs./day
Total Applied Ammonia	51.3 lbs./day
Minimum Depth (LWL)	3.0 ft
Normal Operating Depth	5.0 ft
Maximum Depth for Storage (HWL)	6.0 ft
Total Depth (Top of Berm)	9.0 ft
Number of Non-Aerated Primary Lagoons	Two
Surface Area @ Bottom of Lagoon (600 ft x 600 ft)	8.26 acres each
Surface Area @ LWL (618 ft x 618 ft)	8.77 acres each
Surface Area @ Normal Depth (630 ft x 630 ft)	9.11 acres each
Surface Area @ HWL (636 ft x 636 ft)	9.29 acres each
Surface Area @ Top of Berm (654 ft x 654 ft)	9.82 acres each
Volume @ LWL	8.32 MG each
Volume @ Normal Depth	14.15 MG each
Volume @ Maximum Depth	17.15 MG each
Storage Volume (Between LWL and HWL)	8.82 MG each
Detention @ Normal Depth (14.15 * 2 MG/0.205 MGD)	138 days

Non - Aerated Secondary Lagoon:

IEPA Criteria for BOD Loading	26 lbs. BOD/acre-day
BOD Loading	113 lbs./day
Ammonia Loading	13.0 lbs./day
Minimum Depth (LWL)	3.0 ft
Normal Operating Depth	5.0 ft
Maximum Depth for Storage (HWL)	6.0 ft
Total Depth (Top of Berm)	9.0 ft
Number of Non-Aerated Secondary Lagoons	One
Surface Area @ Bottom of Lagoon (420 ft x 420 ft)	4.05 acres
Surface Area @ LWL (438 ft x 438 ft)	4.40 acres
Surface Area @ Normal Depth (450 ft x 450 ft)	4.65 acres
Surface Area @ HWL (456 ft x 456 ft)	4.77 acres
Surface Area @ Top of Berm (474 ft x 474 ft)	5.16 acres
Volume @ LWL	4.13 MG
Volume @ Normal Depth	7.08 MG
Volume @ Maximum Depth	8.61 MG
Storage Volume (Between LWL and HWL)	4.48 MG

Total Storage

Total Available Storage Volume (b/w Primary & Secondary)	22.12 MG
Number of Days of Storage at DAF	108 days
Number of Days of Storage at DWF	135 days

Sand Filter:

Number of Filters	2
Surface Area per Filter (130 x 130)	16900 ft^2
Total Filter Area	33800 ft^2
Hydraulic Loading Rate	8.1 gpd / ft^2

Chlorination:

No facilities designed – Assuming COB-Lake Bloomington can receive Chlorination Exemption.

Aerated Lagoon System

Aerated Primary Lagoon:

IEPA Criteria for BOD Loading	0.5 lbs. BOD/1000 ft^3
Total Applied BOD	451 lbs./day
Total Applied Ammonia	51.3 lbs./day
Minimum Depth (LWL)	8 ft
Normal Operating Depth	10 ft
Maximum Depth for Storage (HWL)	12 ft
Total Depth (Top of Berm)	15 ft
Surface Area @ Bottom of Lagoon (260 ft x 260 ft)	1.55 acres
Surface Area @ LWL (308 ft x 308 ft)	2.18 acres
Surface Area @ Normal Depth (320 ft x 320 ft)	2.35 acres
Surface Area @ HWL (332 ft x 332 ft)	2.53 acres
Surface Area @ Top of Berm (350 ft x 350 ft)	2.81 acres
Volume @ LWL	4.84 MG
Volume @ Normal Depth	6.31 MG
Volume @ Maximum Depth	7.90 MG
Storage Volume (Between LWL and HWL)	3.07 MG
Detention @ Normal Depth (6.31 MG/0.205 MGD)	31 days

Aeration Requirement in Primary Lagoon:

Oxygen Required for BOD	676.5 lbs. O_2 / day
Oxygen Required for NH3-N	236 lbs. O_2 / day
AOR	912.5 lbs. O_2 / day
SOR (AOR / 0.5)	1825 lbs. O_2 / day
Air Flow	976.5 SCFM

Aerated Secondary Lagoon:

IEPA Criteria for BOD Loading	0.3 lbs. BOD/1000 ft^3
BOD Loading	113 lbs./day
Ammonia Loading	13.0 lbs./day
Minimum Depth (LWL)	8 ft
Normal Operating Depth	10 ft
Maximum Depth for Storage (HWL)	12 ft
Total Depth (Top of Berm)	15 ft
Surface Area @ Bottom of Lagoon (150 ft x 150 ft)	0.52 acres
Surface Area @ LWL (198 ft x 198 ft)	0.90 acres
Surface Area @ Normal Depth (210 ft x 210 ft)	1.01 acres
Surface Area @ HWL (222 ft x 222 ft)	1.13 acres
Surface Area @ Top of Berm (240 ft x 240 ft)	1.32 acres

Volume @ LWL	1.82 MG
Volume @ Normal Depth	2.45 MG
Volume @ Maximum Depth	3.14 MG
Storage Volume (Between LWL and HWL)	1.32 MG

Aeration Requirement in Secondary Lagoon:

Oxygen Required for BOD	170 lbs. O_2 / day
Oxygen Required for NH3-N	60 lbs. O_2 / day
AOR	228 lbs. O_2 / day
SOR (AOR / 0.5)	456 lbs. O_2 / day
Air Flow	244 SCFM

Tertiary (Storage) Lagoon:

IEPA Criteria for BOD Loading	26 lbs. BOD/day-acre
BOD Loading	28.3 lbs./day
Ammonia Loading	3.3 lbs./day
Minimum Depth (LWL)	2 ft
Maximum Depth for Storage (HWL)	12 ft
Total Depth (Top of Berm)	15 ft
Surface Area @ Bottom of Lagoon (400 ft x 400 ft)	3.67 acres
Surface Area @ LWL (412 ft x 412 ft)	3.90 acres
Surface Area @ 10.0 ft of Depth (460 ft x 460 ft)	4.86 acres
Surface Area @ HWL (472 ft x 472 ft)	5.11 acres
Surface Area @ Top of Berm (490 ft x 490 ft)	5.51 acres
Volume @ LWL	2.47 MG
Volume @ Normal Depth	13.85 MG
Volume @ Maximum Depth	17.10 MG
Storage Volume (Between LWL and HWL)	14.64 MG

Total Storage

Total Available Storage Volume	19.0 MG
Number of Days of Storage at DAF	93 days
Number of Days of Storage at DWF	116 days

Sand Filter:

Number of Filters	2
Surface Area per Filter (130 x 130)	16900 ft^2
Total Filter Area	33800 ft^2
Hydraulic Loading Rate per filter	8.1 gpd / ft^2

Chlorination:

No facilities designed – Assuming COB-Lake Bloomington can receive Chlorination Exemption.

Covered Aerated Lagoon System

******* Based on LemTec Biological Treatment System, Lemna Technologies, Inc. ******

Aerated Primary Lagoon:

********* Same design and dimensions as the one for Aerated Lagoon System *********

In addition, primary lagoon will be equipped with Lemna LemTec insulated cover, baffle and aeration system.

Aerated Secondary Lagoon:

********* Same design and dimensions as the one for Aerated Lagoon System *********

In addition, secondary lagoon will also be equipped with Lemna LemTec insulated cover system.

Polishing Reactor

The Lemna Polishing Reactor (LPR) is a final step in the LemTec Biological Treatment Process. The Lemna LPR is a fixed film reactor consisting of aerated, submerged, attached growth media modules, which maintain a population of bacteria used for final polishing of the effluent.

The LPR in this case would have 12 modules each 6' by 6' and 8' deep.

Proceeding these modules there will be a Lemna fine bubble aeration system.

Land Application System with Aerated Lagoons

Aerated Primary Lagoon:

********* Same design and dimensions as the one for Aerated Lagoon System *********

Aerated Secondary Lagoon:

********* Same design and dimensions as the one for Aerated Lagoon System *********

Storage (Tertiary) Lagoon:

IEPA Criteria for BOD Loading	26 lbs. BOD/acre-day
BOD Loading	28.3 lbs./day
Ammonia Loading	3.3 lbs./day
Minimum Depth (LWL)	2.0 ft
Normal Operating Depth	10.0 ft
Maximum Depth for Storage (HWL)	12.0 ft
Total Depth (Top of Berm)	15.0 ft
Surface Area @ Bottom of Lagoon (560 ft x 560 ft)	7.20 acres
Surface Area @ LWL (572 ft x 572 ft)	7.51 acres
Surface Area @ Normal Depth (620 ft x 620 ft)	8.82 acres
Surface Area @ HWL (632 ft x 632 ft)	9.17 acres
Surface Area @ Top of Berm (650 ft x 650 ft)	9.70 acres
Volume @ LWL	4.79 MG
Volume @ Normal Depth	26.06 MG
Volume @ Maximum Depth	31.92 MG
Storage Volume (Between LWL and HWL)	27.13 MG

Total Storage

Total Available Storage Volume	31.52 MG
Number of Days of Storage at DAF	154 days
Number of Days of Storage at DWF	192 days

Land Application (Slow Rate Infiltration) Criterion:

Type of Wastewater	Secondary Treated
Wastewater Storage Season	150 days -- November through March
Wastewater Applying Season	April through October
Hydraulic Loading Rate	16 inch / year (0.53 inch / week)
Land Area needed	172 acres
Irrigation System	Center Pivot

Onsite Wastewater Treatment System

******* Based on Orenco Recirculating Sand Filter Systems, Orenco Systems, Inc. ******

Recirculating Sand Filter (RSF)

Number of RSF Systems	4
Design Flow (gpd)	53,000 each
Number of Recirculating Tanks	2 required per system
Recirculating Tank Capacity (Gallons)	30,000
Number of Sand Filter	1 per system
Size of Sand Filter (sq. ft)	11,000 each
Loading Rate (gal/sq ft/day)	4.8

Wastewater Transfer Options

Storage (Equalization) Basin

Storage (Equalization) basin is proposed to allow constant wastewater flow to the BNWRD and/or Town of Normal Pump Station and to reduce the size of forcemain.

Storage Basin Volume	0.36 Million Gallon
Design Aspects	Concrete basin with aeration/mixing equipment
Basin Size	70' * 70' * 12'

East or West Pump Station:

This pump station would be used to transfer wastewater to BNWRD.

IEPA Criteria	Pump Design Maximum Flow with the largest unit out of service
Pumping Capacity	320 gpm
Pumping Arrangements	2 submersible pumps, One lead pump and another one as a lag (back-up) pump

Central Force Main

Size	8-inch
Capacity	320 gpm
Length	Variable, depending on the location of the discharge pump station

Odor and Septicity Control

Installation of a bulk chemical feed system at the pump station consisting of bulk storage (fiberglass) tank, chemical feed pumps and controls. Chemical will be fed at the pump station. Significant odor and septicity reduction is expected by oxidizing compounds at the source.

H_2S Concentration	Average, 2 ppm Maximum, 5 ppm
Design Chemical Feed Ratio	1 gal of Chemical / 1 lbs. of Dissolved H_2S
H_2S Generation Rate	Average, 3.4 lbs./day Maximum, 8.6 lbs./day
Chemical Feed Rate	8.6 gallons per day (gpd)
Bulk Monthly Storage Required	257 Gallons
Capacity of Storage	250 Gallons Storage Tote

Appendix B

Ammonia Worksheet

Discharger: **COB Lake Bloomington** NPDES: ________ Date: 3/20/03

Receiving Stream (BSC rating): various streams around Lake Bloomington

Calculation of the total ammonia (as N) water quality standard

pH and temperature values used in calculation

	pH 50th %ile	pH 75th %ile	temp 75th %ile
Spring/Fall	7.73	8.11	17.8
Summer	7.70	7.80	22.3
Winter	7.79	7.99	5.5

Total ammonia (as N) water quality standard

	Chronic (50th %ile)	Chronic (75th %ile)	Acute (75th %ile)
Spring/Fall	2.8	1.7	6.8
Summer	2.2	1.9	12.1
Winter	5.2	4.0	8.6

Data Source: AWQMN station DK-13, Mackinaw River, below Congerville, for the dates Jan. 1997 to Dec. 2001.

Note: Calculation of total ammonia (as N) water quality standards are based on the algorithms found at 35 IAC 302.212(b) and recommended water quality based limits for ammonia are derived pursuant to methodologies outlined at 35 IAC Part 355.
Spring/Fall consists of March - May, September - October.
Summer consists of June - August.
Winter consists of November - February.

Chronic Wasteload Allocation

Ce= [Cds(Qus+Qe)-CusQus] / Qe

Effluent Flow (Qe): 0.325 cfs (DAF)
Upstream 7Q10: 0 cfs Source: ISWS map of the Kankakee River Region.
7Q10 for dilution (Qus): 0 cfs

NO MIXING AVAILABLE DURING 7Q10 LOW-FLOW CONDITIONS

wasteload allocation:			
spring/fall	1.7	mg/L	(based on 75th percentile pH)
summer	1.9	mg/L	(based on 75th percentile pH)
winter	4.0	mg/L	(based on 75th percentile pH)

Acute Wasteload Allocation

Ce= S(Cds-Cus)+Cus

NO MIXING AVAILABLE DURING 7Q10 LOW-FLOW CONDITIONS

wasteload allocation:		
spring/fall	6.8	mg/L
summer	12.1	mg/L
winter	8.6	mg/L

WQBELs Recommended:

Daily Maximum:	spring/fall	6.8 mg/L
	summer	12.1 mg/L
	winter	8.6 mg/L
30-day Average:	spring/fall	1.7 mg/L
	summer	1.9 mg/L
	winter	4.0 mg/L
Weekly Average*:	spring/fall	4.3 mg/L
	summer	4.8 mg/L
	winter	N/A mg/L

DRAFT

* Note: Weekly average limits are based on the subchronic standard which is defined as 2.5 times the chronic standard at 35 IAC 302.212(b)(3).

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276

RENEE CIPRIANO, DIRECTOR

217/782-3362

SEP 2 0 2002

Mrs. Farida Goderya
Farnsworth Group
2709 McGraw Drive
Bloomington, Illinois 61704

RE: Proposed Permit Limits for COB Lake Bloomington

Dear Mrs. Goderya:

The following table lists the proposed permit limits if this discharge were to receive a NPDES permit. All of the proposed outfall locations discharge to stream that have a 7Q10 flow of 0 cfs and therefore receive no benefit from dilution. The discharge was modeled at the design average flow of 0.21 MGD (0.325 cfs). Temperature and pH data from AWQMN station, DK-13, Mackinaw River, below Congerville, was used in the ammonia worksheet. Proposed permit limits are expressed in units of mg/L. Values used to calculate total ammonia limits are given in the attached fact sheets.

Except as noted, values in the following table are water quality standards as found in 35 IAC Part 302.

Substance	Daily Maximum Permit Limit	Monthly Average Permit Limit
$CBOD_5$ *	20	10
TSS *	24	12
pH ***	6 - 9	
Ammonia		
Summer	4.8	1.5
Winter	7.2	2.0
Total Residual Chlorine	** 0.05	-
Fecal Coliform (colonies/100 mL)	400	-

* This limit is based on 35 IAC 304.120.
"-" No limit recommended.
** Limits based on detection limit per the water quality standard.
*** This limit is based on 35 IAC 304.125

The discharge may be eligible for a year-round disinfection exemption.

I must caution you that the limits given above are subject to change based on new stream data. Firm limits will be available when the permit application is received. Further, new ammonia water quality standards are now before the Illinois Pollution Control Board. Adoption of this standard would change the ammonia limits, most notably to make the winter 30 day average less stringent.

Perhaps the most important aspects of permitting the facility lie in antidegradation regulations. New facilities require an antidegradation evaluation which could result in more restrictive limits than those given above.

The Mackinaw River upstream of Money Creek is classified as a General Use Water and is rated an "A" stream under the Agency's Biological Stream Characterization (BSC) program. The Mackinaw River, Waterbody Segment, DK-20, is found on the Illinois draft 2002 303(d) list. The cause of impairment given for the segment at that time was PCBs. The source associated with the impairment is unknown.

Lake Bloomington is classified as a General Use Water and is not rated under the Agency's Biological Stream Characterization (BSC) program. Lake Bloomington, Waterbody Segment, RDO, is found on the Illinois draft 2002 303(d) list. The causes of impairment given for the segment at that time were excessive algal growth/chlorophyll *a*, nutrients, phosphorus, nitrogen (ammonia-N), and nitrates. The sources associated with the impairment are Agriculture, Crop Related Sources, non-irrigated crop production, Construction, land development, and Herbicide/Algicide Application.

Money Creek is classified as a General Use Water and is rated a "C" stream under the Agency's Biological Stream Characterization (BSC) program. Money Creek, Waterbody Segment, DKP-02, is not found on the Illinois draft 2002 303(d) list.

The Illinois Natural History Survey does not list the above waters as a biologically significant stream nor does it indicate that any threatened or endangered species of aquatic life are resident according to the 1992 publication Biologically Significant Illinois Streams.

Additionally, phosphorous limits would be considered for a discharge to an unnamed tributary of Lake Bloomington (locations 4, 5, and 6) since one of the causes of impairment is phosphorous on the draft 2002 303(d) list.

Based on my preliminary review, the discharge to an unnamed tributary to Money Creek (location 3) is the preferred discharge location.

It would be advisable to initiate the consultation process on threatened and endangered species with the Illinois Department of Natural Resources, Division of Resources Review and Coordination prior to picking a discharge location. They can be reached at 217/785-0476.

If you have any questions or comments regarding these proposed permit limits, please contact me at the above address and phone number.

Sincerely,

Scott Twait

Scott Twait
Water Quality Standards Unit
Bureau of Water

SAT:lakebloomington

Attachment

Ammonia Worksheet

Discharger: COB - Lake Bloomington NPDES: ________ Date: 09/19/02

Receiving Stream (BSC rating): unnamed tributary of Money Creek (unrated)

Conversion of un-ionized standards

un-ionzed standards (mg/L)	Acute:	0.33 (summer)	0.14 (winter)
	Chronic:	0.057 (summer)	0.025 (winter)

pH and temperature values used in conversion

	pH		temp
	50th %ile	75th %ile	75th %ile
Summer	7.80	8.20	21.3
Winter	8.00	8.20	4.4

Equivalent total ammonia concentrations

	Chronic		Acute
	(50th %ile)	(75th %ile)	(75th %ile)
Summer	2.0	0.8	4.8
Winter	2.0	1.3	7.2

Data Source: AWQMN station DK-13, Mackinaw River, below Congerville, for the dates Jan. 1994 to Dec. 1998.

Note: Conversion of un-ionized ammonia standards to total ammonia concentrations are based on the algorithm found at 35 IAC 302.212(c) and recommended water quality based limits for ammonia are derived pursuant to methodologies outlined at 35 IAC Part 355.

Chronic Wasteload Allocation

Ce= [Cds(Qus+Qe)-CusQus] / Qe

Effluent Flow (Qe):	0.325 cfs	(DAF)	
Upstream 7Q10:	0 cfs	Source:	ISWS map of the Kankakee River Region.
7Q10 for dilution (Qus):	0 cfs		

NO MIXING AVAILABLE DURING 7Q10 LOW-FLOW CONDITIONS

wasteload allocation:	summer	*2.0* mg/L	(based on median pH)
	winter	*2.0* mg/L	(based on median pH)

Acute Wasteload Allocation

Ce= S(Cds-Cus)+Cus

NO MIXING AVAILABLE DURING 7Q10 LOW-FLOW CONDITIONS

wasteload allocation:	summer	*4.8* mg/L
	winter	*7.2* mg/L

WQBELs Recommended:	**Daily Maximum:**	summer	4.8 mg/L
		winter	7.2 mg/L
	30-day Average:	summer	1.5 mg/L *
		winter	2.0 mg/L

* limited to 1.5 mg/L when using median pH.

Appendiv VI- Manual of Practice of the Subdivision Ordinance

MANUAL OF PRACTICE FOR THE DESIGN OF PUBLIC IMPROVEMENTS IN McLEAN COUNTY

Chapter 1 - Engineering and Administration Procedures

1.01 INTRODUCTION

A major share of what eventually becomes publicly owned improvements are designed and constructed by private interest. This manual has been prepared to insure that the design of such improvements will result in construction meeting the requirements of McLean County. This chapter explains the processing requirements and procedures as required by the Subdivision Ordinance of McLean County for the various documents required prior to, during, and after construction in order to accomplish these purposes.

The manual is also intended to provide a uniform design criteria for facilities designed for or by McLean County.

Metric equivalent measurements have been incorporated into this manual and are denoted in parenthesis following the English measurement.

1.02 DEFINITION OF TERMS

The following words and terms, whenever they occur in this manual shall be interpreted as herein defined.

<u>ADA.</u> Americans with Disabilities Act.

<u>Abutting (Contiguous, Adjacent)</u>. To have one or more common boundary lines or district lines.

<u>Alley.</u> A public right-of-way which is thirty (30) feet (10 m) or less in width and affords a secondary means of access to abutting property. Frontage on an alley shall not be construed as satisfying the requirements related to frontage on a public street.

<u>As Built Plans.</u> See Record Drawings

<u>Block.</u> A block is a tract of land bounded by public streets, or by a combination of streets and public parks, cemeteries, railroad right-of-way, shorelines of waterways, or any other lines of demarcation.

<u>Building Setback Line.</u> A line within a lot, or other parcel of land, so designated on the preliminary plan, which denotes the area between such line and the adjacent street right-of-way line where an enclosed building, and other obstructions are prohibited, except those permitted obstructions as regulated by the McLean County Zoning ordinance.

<u>Clear Water Collection Tile.</u> An underground, enclosed conduit designed to carry sump pump/footing tile water, cooling water, swimming pool wastewater, etc.

<u>Common Collector (Collection Tile)</u> An underground, enclosed conduit designed to carry treated sewage effluent or clear water discharges from more than one lot of record.

Conduit. A buried pipe for the installation of wires or cables or the conveyance of gas, water, storm water or sewage.

Contractor. An individual, company, firm or other party or organization who contracts to physically construct all or a portion of a project for either a developer or McLean County.

Cradle. Bedding placed under and around a conduit for proper support.

Cul-de-sac. A minor street with only one outlet.

Design Engineer. The individual, responsible for the design and preparation of plans, specifications, and contract documents and who is a Licensed Professional Engineer in the State of Illinois.

Developer. An individual, company, firm or other party or organization who will be responsible for paying the cost of a project.

Development. Both the act of changing and the state of land after its function has been purposefully changed by man including, but not limited to, construction of structures on the land, and alterations to the land, except grading that does not alter the natural flow of storm water.

Drainageway, Improved. A portion of a right-of-way used or intended principally for storm, surface or ground water drainage which meets or exceeds the design and/or construction standards for public drainageways.

Drainageway, Unimproved. A portion of a right-of-way used or intended principally for storm, surface or ground water drainage that does not meet or exceed the design and/or construction standards for public drainageways.

Driveway. A private access for motor vehicles between a public or private street and one or more structures or off-street parking areas.

Easement. A quantity of land set aside over or under which a liberty, privilege, or advantage in land without profit, is dedicated and is distinct from ownership of the land, is granted either to the public, a particular person or a combination of both.

Field Inspector. An individual, company or firm appointed by the County Engineer to inspect construction to insure compliance with approved plans and specifications.

Final Development Plan. A final plan that is required to be submitted to McLean County as specified in the Planned Unit Development regulations.

Final Plat. A map or plan for a subdivision and any accompanying material as described hereafter.

Final Punch List. A tabulation of deficiencies requiring corrective action prior to final acceptance of the project.

Frontage. The measure of lineal contiguity between a lot or portion thereof and another lot, public street, alley or public way.

Frontage Road. A minor street which is parallel and either adjacent to or within the right-of-way of a thoroughfare.

IDPH. Illinois Department of Public Health.

IEPA. Illinois Environmental Protection Agency.

Live Storage. That volume available in a storm water detention basin for runoff in accordance with the requirements of this manual.

Lot. A quantity of land capable of being described with such definiteness that its location and boundaries may be established and which is designated by its owner or developer as land to be conveyed, used or developed as a unit or which has been conveyed, used or developed as a unit, including any easements appurtenant thereto. Said land shall have frontage on a public or private street.

Lot, Double Frontage A lot which has a pair of opposite lot lines along two substantially parallel streets.

Lot of Record. A lot in a finally platted and recorded subdivision.

Manual. This document entitled "Manual of Practice for the Design of Public Improvements in McLean County."

Median. An area between two parallel streets or roadways.

"No-Access" Strip. A parcel of land at least one (1) foot (300mm) in width along a lot line within which no vehicular driveways shall be permitted.

Official Comprehensive Plan. Is the composite of the functional and geographic elements of the Comprehensive Plan of McLean County, or any segment thereof in the form of plans, maps, charts, textual and the official map, as adopted by the McLean County Board.

Official Map. A map adopted by the McLean County Board as part of the Comprehensive Plan which is designated "Official Map" in that Plan.

Official Zoning Map. A map adopted by the McLean County Board showing all the zoning district boundaries within limits of McLean County but outside the corporate limits of any municipality.

Outlot. A lot depicted on a final subdivision plat which does not meet the requirements of this Ordinance for lots of record and which may not be used for buildings or parking lots or other improvements except in connection with an adjacent lot as permitted by the Zoning Ordinance.

Parkway. The unpaved strip of land within a street right-of-way between a curb or edge of pavement and the right-of-way line.

Pedestrian Way. A right-of-way across or within a block designated for pedestrian use.

Planned Unit Development. A lot which is developed as a unit under single ownership or unified control, which includes one (1) or more principal buildings or uses, and is processed under the planned unit development procedure of the Zoning Ordinance.

Preliminary Development Plan. A tentative map or plan of a proposed development under the Planned Unit Development regulations.

Preliminary Plan. A plan of a proposed subdivision as described in this Ordinance.

Project. All of the various parts of proposed construction submitted to the County Engineer for approval.

Public Improvements. Public improvements includes streets, public utilities and other structures, fixtures or land appurtenances which are or are intended to be dedicated to the public, generally a Township or County.

Release Rate. The controlled rate at which storm water is released from a storm water detention/retention basin, not including overflow.

Right-of-Way. A strip of land dedicated to or used by the public for vehicular and/or pedestrian passage; storm, surface or ground water drainage; or public utility placement.

Roadway. A portion of a right-of-way used or intended principally for vehicular passage, with appurtenant drainage ditches, ways or structures which meet or exceed the design standards for the classification it holds.

Sidewalk. A portion of land used or intended principally for pedestrian passage, which meets or exceeds the design standards for public sidewalks.

Storm Water Detention Basin. A reservoir designed and built for temporary storage of surface runoff, either on, below or above ground surface accompanied by controlled release of the entire stored water.

Storm Water Retention Basin. A wet bottom reservoir designed and built for temporary storage of surface runoff, above normal water level of the reservoir, accompanied by controlled release of the part of the stored water above normal water level of the facility.

Street. That portion of a public right-of-way used and maintained by the appropriate highway authority which affords the public the principal means of access to adjacent lots of record or property and meets the design and construction standards for the classification it holds.

Street, Boulevard. A street with a nonmountable median, usually with grass surface.

Street, Collector. A collector street functions to conduct traffic between major streets and/or activity centers. It is a principal traffic artery within residential areas and carries moderate volumes of traffic. A collector street has potential for sustaining minor retail or other commercial establishments along its route which sill influence the traffic flow.

Street, Exterior. A street on the perimeter of a subdivision.

Street, Interior. A street entirely within the confines of a subdivision.

Street, Local. A short street, cul-de-sac, or court, the primary purpose of which is to conduct traffic to and from dwelling units or businesses to other streets within the hierarchy of streets.

Street, Major. A street, which has a high average daily traffic (ADT) and is not intended to be a residential street. A major street provides connection with major state and interstate roadways and has a high potential for the location of significant community facilities as well as retail, commercial and industrial facilities.

Street Standards and Classifications. The standards and classifications shall be the existing Illinois Department of Transportation classifications and standards as modified by the County Board pertaining to requirements for streets, as from time to time amended.

Street, Stub. A temporary dead-end street that extends to the boundary of the subdivision to provide future connection of streets to abutting unsubdivided tracts.

Subdivide. (1) The division of land into two (2) or more lots, parcels, or tracts; (2) the dedication of streets, ways, or other areas for use by the public; or (3) any division of land which creates more than one additional lot for transfer or ownership and/or building development, or where a new street or easement of access is involved; or (4) meets the definition of a Planned Unit Development as defined in the McLean County Zoning Ordinance; or (5) a long term lease of more than ten (10) years for new development.

Subdivision. The configuration of lots of record, outlots, public rights-of-way and public improvements that result from subdividing land in accordance with the procedures, requirements, and standards of this Ordinance.

Tertiary Treatment. A type of process designed to bring an IEPA common collector discharge into compliance with the current IEPA chemical and biological discharge requirements.

Unified Control. Unified control is the combination of two (2) or more tracts of land either through unified ownership or other arrangement, wherein each owner has agreed to allow use and develop their tracts as a single lot under the provision of the ordinance applicable to Planned Unit Developments.

Use. The purpose or activity for which the land, or building thereon, is designed, arranged, or for which it is occupied or maintained, and shall include any manner of performance of such activity with respect of the regulations of the Zoning Ordinance.

Watershed. That land area from which all runoff from rainfall would eventually reach the point in question by flowing over the surface of the ground or through existing improvements.

1.03 SCOPE

The review and approval of plans, specifications, and contract documents for certain types of improvements is also the legal responsibility of various other public agencies in addition to the County of McLean. This Manual is not intended as a substitute for the requirements of such other public agencies. It shall be the Design Engineer's responsibility to see that the proposed plans, specifications, and contract documents meet the legal requirements of all other public agencies and that any and all permits and bonds by such agencies are secured.

1.04 PRE-DESIGN CONFERENCE

Prior to the development of a Preliminary Plan and/or detailed Engineering Plans and Specifications the Design Engineer shall meet with the Director of Building and Zoning and other staff as may be necessary to review County requirements and the proposed project. The design engineer shall prepare a plat drawn to an engineering scale showing the street layout and any other major appurtenances as may be necessary. The request for this preliminary meeting shall be instituted by the Design Engineer.

1.05 PLAN PREPARATION REQUIREMENTS

A. Concept Plan - The concept plan shall be drawn to an engineering scale and shall show the conceptual configuration of the proposed subdivision including the location of streets, lots, drainageways, ponds, land uses and any existing natural features such as streams or lakes. A short narrative shall also accompany the drawing dealing with proposed public improvements such as water supply and wastewater treatment.

B. Preliminary Plan and Supporting Documents

1. Required Form of a Preliminary Plan
Plans, drawings, surveys, maps, schematics and comparable material shall be drawn so that clear and legible transparent or contact prints and photostatic copies can be made with a maximum width of twenty-four inches (24") (594cm), with a maximum length of thirty-six inches (36") (841cm). If the total preliminary plan exceeds one sheet, then an additional drawing, showing the entire area of the preliminary plan, drawn to a smaller scale shall be provided to show the general layout.
2. Required Content of a Preliminary Plan and Supporting Documents.

a. Identification and Description

1. Name of the subdivision, not duplicating the name of any other subdivision, the final plat of which has been recorded in McLean County, Illinois;
2. The legal description of all property included in the Preliminary Plan, including a reference to the Section, Township and Range;
3. The name, address, and telephone number of the owner or owners of record of all property within the Preliminary Plan;
4. The name, address, and telephone number of the developer of the proposed subdivision;
Disclosure of the legal relationship, if any, between the owner and developer, including any of the following:
i. Agent of owner;
ii. Purchaser under a Contract for Sale with owner, contingent or otherwise;
iii. Unrecorded owner; and
iv. Contract purchaser.

5. The name, address, and telephone number of the engineering firm preparing the boundary survey;
6. The name, address, telephone number and seal of the

Registered Engineer preparing any part of the Preliminary Plan or supporting material;

7. The name, address, and telephone number of the attorney(s) representing the owner(s) and/or developer(s);
8 . The source of all topographic data;
9. Total acreage (hectares) of the Preliminary Plan; and
10. All notices as shown in Appendix A.

b. Survey Maps and Drawings Indicating Existing Conditions

A Registered Illinois Land Surveyor or Registered Professional Engineer shall prepare graphic presentations of the following in each case, with a north point designated as true North and a date of preparation indicated on the survey map, drawing or plan. Unless otherwise noted, the following shall be drawn to an engineering scale not to exceed 100 feet to 1 inch (1000:1)

1. Boundary Line Survey Map with accurate distances and angles with a permissible error of closure of 1 in 5000 prepared and certified accurate by a Registered Illinois Land Surveyor;
2. Topographic map depicting existing contours at vertical intervals of not more that two (2) feet (.5 meters), with reference to U.S.G.S. Datum;
3. Location and perimeter of any area designated as a special flood hazard area as defined by the Federal Emergency Management Agency. If any part of a proposed subdivision lies within an area delineated on the federal Flood Insurance Rate Maps for the County as a Special Flood Hazard Area the base flood elevation shall be furnished by the subdivider. If the property included in the preliminary plan is not in a special flood hazard area the Surveyor or Engineer shall so state on the preliminary plan.

4. The existing zoning and zoning district lines within the area encompassed by the Preliminary Plan and the area within two hundred (200) feet (60 meters) thereof;
5. Specific identification, location and dimensions, if applicable, of the following located within two hundred (200) feet (60 meters) of the area included in the Preliminary Plan:

   i. Rights-of-way;
   ii. Streets;
   iii Roadways;

iv. Drainageways; improved;
v. Drainageways; unimproved;
vi. Walkways;
vii. Sidewalks;
viii. Public easements;
ix. Private easements;
x. Railroad rights-of-way;
xi. Section lines;
xii Corporate limit lines;
xiii. Parks, schools, and other public lands;
xiv. Buildings and structures to remain; and
xv. Buildings and structures to be removed.

6. Identification, location, size, effective drainage area, gradient and invert elevation of sanitary sewers, storm sewers, drainage culverts, catch basins and sanitary and storm sewer manholes located within or which pass through the area included in the Preliminary Plan, or within two hundred (200) feet (60 meters) of the perimeter of the area included in the Preliminary Plan;
7. Identification and location of water mains, including all valves and hydrants and any other underground utilities located within the area included in the Preliminary Plan, or within two hundred (200) feet (60 meters) thereof;
8. Location of or reference to location of the boundary line survey map and bench marks;
9. Location map drawn to a scale of not less than one (1) inch equals one thousand (1000) feet (1000:1), showing the area bounded by the nearest major or arterial street, but not less than two (2) miles (3km) beyond the boundaries of the area included in the Preliminary Plan;

10. The location of any known private or public sewage disposal systems within the area included in the Preliminary Plan and within two hundred (200) feet (60m) thereof; and
11. The location of any public or private water wells and water distribution systems located within the boundary of the Preliminary Plan or within two hundred (200) feet (60m) thereof.

c. Surveys, Maps, Plans and Drawings of Proposed Conditions

A Licensed Professional Engineer shall prepare and certify as accurate to the degree of accuracy specified, all surveys, maps, plans and drawings. All such surveys, maps, and drawings shall have a north point designated as true north and containing a date of preparation depicting the proposed arrangement of the area included in the Preliminary Plan indicating each of the following to an engineering scale not to exceed one hundred (100) feet to one (1) inch (1000:1);

1. Identification, location and dimensions of any of the following required or proposed:

    i. Rights-of-way
    ii. Interior streets, exterior streets, and exterior roadways with approximate elevations, proposed gradients, and typical cross-sections;
    iii. Street and roadway names, not duplicating or confusingly similar to the name of any street on a final plat recorded in the County, unless the street is an extension of, or in line with a previously named street, in which event such name shall be used;
    iv. Pedestrian ways, sidewalks, and walkways;
    v. Public and private easements;
    vi. Lots and outlots;
    vii. Minimum front yard building setbacks;
    viii. Railroad crossings and rights-of-way;
    ix. Bridges; and
    i. Areas other than those listed above intended to be dedicated or reserved for non-residential purposes.

2. Identification, location and size of any of the following required or proposed:

    i. Water mains;
    ii. Valves;
    iii. Hydrants; and
    iv. Street lights.

3. Identification, location size, gradient, invert elevation, and typical cross-section of any of the following required or proposed in the area included in the Preliminary Plan:

    i. Drainage ways, improved;
    ii. Drainage ways, unimproved;

iii. Storm drains; and
iv. Open drainage ways.

4. Identification, location, size, gradient, surface elevation, and invert elevation of any of the following required or proposed in the Preliminary Plan:

i. Sanitary Sewers;
ii. Storm sewers;
iii. Collection tile systems; and
iv. Manholes and cleanouts.

5. Direction of storm water runoff from each lot and outlot proposed or required in the Preliminary Plan.

d. The Preliminary Plan shall contain the name and seal or seals of the professional engineer or engineers preparing all or any portion of the Preliminary Plan. All waivers requested of the Ordinance shall be listed on the Preliminary Plan. Approval of a Preliminary Plan shall not constitute waiver of any applicable Ordinance unless specifically approved by the County Board.

C. PUBLIC IMPROVEMENT ENGINEERING PLANS AND SPECIFICATIONS

1. Required Form of Public Improvement Engineering Plans and Specifications

a. Public improvement engineering plans and specifications, drawings, schematics and comparable materials shall be drawn with black waterproof drawing ink on mylar from which clear and legible transparent or contact prints and photostatic copies can be made. All drawings shall be submitted on 24" x 36" (594x841 cm) sheets.

b. Supporting material shall be typed on paper not exceeding 8 1/2 inches by 11 inches in size.

c. General drafting requirements

1. Plan sheets shall be drawn to a scale of not less than 1"=50'

(1:600) horizontal and 1"=10' vertical. The scale shall be clearly labeled on the plans;

2. Plan sheets shall include a north arrow. The arrow should be oriented to the left, top, or right of the sheet;
3. Plan sheets shall include a title block in the lower right corner of the sheet and shall include the name and address of the design engineer, the date of the drawing and the sheet number; and
4. Stationing shall normally increase from left to right.

2. Required Content of Public Improvement Engineering Plans and Specifications

a. Identification and Description - The public improvement engineering plans and specifications shall include a Title Sheet containing the following information:

1. The name of the proposed subdivision within which or for which the public improvements are proposed;
2. The name, address and telephone number of the developer;
3. The name, address and telephone number of the engineering firm preparing any part of the engineering plans and specifications and an indication of the part of the plans that engineer or engineers prepared;
4. Seal or seals of the design engineer or engineers preparing all or any portion of the engineering plans and specifications certifying that the materials so prepared conform with all applicable County ordinances except as specifically noted as a requested waiver;
5. Location map drawn to any scale showing area bounded by the limits of the Preliminary Plan for which the engineering plans were prepared;
6. Two or more benchmark elevations referenced to U.S.G.S. datum within the boundaries of the project or within 100 feet (30 meters) outside the boundaries of the project; and
7. An index to all sheets contained within the submitted engineering plans.

b. Grading Plan - The public improvement engineering plans and specifications shall include a Grading Plan. Said plan shall contain, but not be limited to, the following information:

1. Existing contours at vertical intervals of not more than two (2) feet (.5 meters), with reference to U.S.G.S. datum;
2. Proposed finished ground surface elevations on all corners;

3. Directional arrows of flow of surface water;
4. Elevation of proposed surface at all building sites (pad);
5. Location, description, and surface elevation of all drainage structures;
6. Directional arrows of flow for flood routing for design storms which exceed the capacity of the proposed storm sewers (minimum of 50 year frequency design storm); and
7. Typical cross sections of flood routing channels showing maximum depth of flow.

c. Drainage Way Plan - The public improvement engineering plans and specifications shall include a Drainage Way Plan (if applicable) containing, but not limited to, the following information:

1. Existing contours at vertical intervals of not more than two (2) feet (.5 meters), with reference to U.S.G.S. datum;
2. Proposed alignment of centerline of right-of-way and right-of-way width for the entire length of the proposed improvement and existing alignment for 200 feet (60 meters) upstream and downstream of the improvement;
3. Proposed and existing profiles for entire length of the improvement and existing profile for 200 feet (60 meters) upstream and downstream of the improvement;
4. Typical cross-section of the drainageway improvement; and
5. Cross-sections of the improvement at intervals of fifty (50) feet (15m) showing the before and after 100 year flood surface elevation.

d. Erosion and Sediment Control Plan - The public improvement engineering plans and specifications shall include a plan for controlling erosion and sedimentation for the entire duration of the project. Said plan shall show the following:

1. All erosion and sedimentation control measures necessary to meet the requirements of the ordinance throughout all phases of construction;
2. Proposed seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer, application, and kind and quality of mulch for both temporary and permanent vegetative cover;
3. The type and location of all temporary sedimentation control measures;
4. Provisions for maintenance of sedimentation control

measures; and

5. The name of the person(s) responsible for installation and maintenance of the erosion control measures.

e. Street and Sidewalk Plan - The public improvement engineering plans and specifications shall include a "Street Plan". As sidewalks are not required in county subdivisions, should they be provided they shall be positioned on private property immediately behind the right-of-way line. Said plan shall contain, but not be limited to, the following information:

1. Existing and proposed horizontal street alignments showing centerline, right-of-way, and stationing of all roadways;
2. Existing and proposed profiles of pavement referenced to centerline stationing and U.S.G.S. datum;
3. Should sidewalks be provided, the proposed alignment of sidewalks or walkways showing the edges of the sidewalk;
4. Existing and proposed cross-sections of roadways at an interval of 50 feet (25 m); and
5. Curve data for both horizontal and vertical alignments of all existing and proposed roadways including the station and elevation of the low point on sag curves.

f. Storm Sewer Plan - The public improvement plans shall include a “Storm Sewer Plan”. Said plan shall include, but not be limited to, the following:

1. Alignment and location of existing and proposed storm sewer conduits referenced to stationing;
2. Location and identification of all existing and proposed drainage structures;
3. Size of existing and proposed conduits;
4. Profile of proposed conduits showing invert elevations based on U.S.G.S. datum and crossings of other existing and proposed utilities; and
5. Locations along alignment of proposed conduit of granular trench backfill placement.

g. Sanitary Sewer Plan - Should a public or private sanitary sewer system be provided the public improvement engineering plans and specifications shall include a Sanitary Sewer Plan. Said plan shall include, but not be limited to the following:

1. Alignment and location of existing and proposed sanitary sewer conduits referenced to stationing;
2. Location and identification of all existing and proposed manholes;
3. Location and identification of all proposed sewer services;
4. Size of existing and proposed sewer conduits and services;
5. Profile of proposed sewer conduits showing invert elevations based on U.S.G.S. datum and crossings of other existing and proposed utilities; and
6. Locations along alignment of proposed sewer conduits and services of granular trench backfill placement.

h. Water Main Plan - Should the subdivision be served by a public or private water supply, the public improvement engineering plans and specifications shall include a Water Main Plan. Said plan shall include, but not be limited to, the following:

1. Alignment and location of existing and proposed water main conduits and service lines referenced to stationing;
2. Location and identification of all existing and proposed valves and hydrants;
3. Location and identification of proposed service lines;

4. Size of existing and proposed water main conduits and services; and
5. Locations along the alignment of proposed water main conduits and services for granular trench backfill placement.

i. Composite Utility Plan - A plan showing all proposed utilities must be submitted and approved as part of the construction plans for any proposed subdivision.

j. Specific Details - The public improvement engineering plans and specifications shall contain, but not be limited to, specific details of the following:

1. Typical cross-sections of streets and right-of-way;
2. Intersection details for concrete pavements showing joint locations, elevations, drainage structures and surface water flow; and
3. Cul-de-sac details showing joint locations, drainage structures, surface water flow and centerline control.

k. Standard Details - The public improvement engineering plans and specifications standard shall include, but not be limited to, the following:

1. Pavement and curb and gutter construction;
2. Collection tile and sanitary sewer construction;
3. Storm sewer construction; and
4. Water main construction.

D. FINAL SUBDIVISION PLATS AND SUPPORTING MATERIAL

1. Required Form of Final Plats

a. Final plats shall be drawn with black waterproof drawing ink on mylar, from which clear and legible transparent or contact prints and photostatic copies can be made, the maximum sheet size shall be 24" x 36" (594x841cm).
b. Supporting materials shall be typed on paper not exceeding 8 1/2" x 11" in size.
c. Digital Submission: A digital computer aided drafting file shall be submitted in accordance with Section 1.19 of this manual.

2. Required Content of Final Plat

a. Identification and Description

1. The name of the subdivision, not duplicating the name of any other subdivision of which a final plat has been recorded in McLean County, Illinois;
2. The legal description of all property included in the final plat, including a reference to the section, township and range;
3. The name(s) and address(s) of the developer(s) of the proposed subdivision;
4. The name and address of the Professional Land Surveyor preparing the boundary survey;
5. The total area in acres (hectares) of the final plat; and
6. The name of the school district in which the development is located.

b. Lot, Outlot, and Public Improvement Configuration - A Licensed Illinois Land Surveyor shall prepare and certify as accurate angular and lineal dimensions of all lines, angles and curvatures to an engineering scale not to exceed 100 feet to 1 inch (1000:1) necessary to accurately depict the location of the following:

1. Rights-of-way, including the names of any streets or roadways depicted;
2. Public easements;
3. Proposed lots of record consecutively numbered and keyed on the plat (or on a supplemental sheet) showing the lots platted of the approved preliminary plan;
4. Outlots, indicated consecutively and keyed on the plat (or on a supplemental sheet) showing the outlots platted of the approved preliminary plan;
5. Minimum front yard setbacks;
6. Other areas dedicated or reserved to the public;
7. Railroad rights-of-way;
8. Boundaries of the subdivision;
9. Field references to:

    i. The nearest established street lines and monuments which shall be accurately described in the plat by location and size;

    ii Township, section lines and 1/4 section lines if the same are within the boundary of the final plat or within one hundred (100) feet (30m) therefrom, referenced accurately to the lines of the subdivision by distances and angles. This requirement may be waived for the resubdivision of an existing final plat;

    iii State plane coordinates; and

    iv All monuments placed at all block corners, angle points and at intermediate points installed in such a manner that they may be located by a Professional Land Surveyor.

10. A signed statement by a Licensed Professional Land Surveyor stating which lots (if any) are located within a Special Flood Hazard Area; and
11. Chord distances for all curvalinear lot lines either on the plat or provided in a table on a separate sheet.

c. Certificates - The final plat shall be accompanied by the following certificates duly and appropriately executed in substantially the form presented in the Appendix of the exhibit specified:

1. Owners Certificate
2. Surveyor's Certificate
3. Drainage Certificate
4. County Clerk Certificate
5. Plat Officer Certificate
6. Performance Bond
7. Surety

1.06 SPECIFICATION REQUIREMENTS

Technical specifications shall be submitted with the public improvement engineering plans as required in this Ordinance and shall be complete in themselves, except that appropriate specific sections of the most recent edition of the "Standard Specifications for Road and Bridge Construction" and the latest edition of the "Supplemental Specifications for Road and Bridge Construction" as published by the Illinois Department of Transportation, and the "Standard Specifications for Water and Sewer Main Construction in Illinois", and the various standard published material specifications prepared by associations such as the American Society for Testing and Materials and the American Water Works Association, may be incorporated by reference.

The specifications shall include, but not be limited to, all information not shown on the drawings which is necessary to establish in detail the quality of materials and workmanship required in the project, other parameters for testing the various parts of the project and instructions for testing material and equipment.

Special provisions specific to construction within the County are specified in the various chapters of this manual and are to be used as guide for the preparation of specifications to be submitted to the County Engineer for review and approval.

1.07 DESIGN COMPUTATION REQUIREMENTS

A. Design computations shall be made by the Design Engineer for all phases of the project when such computations are required by this manual or by the County Engineer to insure the adequacy and stability of the work. Said computations shall be neat and legible and in a form required by this manual and that can be readily followed and understood by a competent engineer experienced in the field.

   Said computations will include, but not be limited to the following:

   1. Submitted with Subdivision Preliminary Plan: Preliminary design calculations used by the Design Engineer for the following:

a. Detention basin design;
b. Storm sewer system design; and
c. Sanitary sewer design

These requirements may be deferred or waived at the time of submission of the preliminary plan with the consent of the County Engineer.

2. Submitted with Public Improvement Engineering Plans: Detailed design calculations for the following:
   a. Detention Basin design;
   b. Storm sewer system design;
   c. Sanitary sewer system;
   d. Flood routing and waterway design;
   e. Bridge and culvert hydraulic design;
   f. Coordinate geometry calculations for public right-of-ways;
   g. Traffic generation data; and
   h. Structural design data.

3. Submitted with Final Subdivision Plats
   a. Boundary closure calculations;
   b. Lot corner coordinate data in digital format; and
   c. Ties to GIS monuments.

A. The form and content for each set of detailed design computations submitted with Public Improvement Engineering Plans and Final Subdivision Plats are Specified in the following chapters of this manual.

1.08 ESTIMATE REQUIREMENTS

The Design Engineer shall prepare a detailed estimate of the cost of the work, categorized to show the various divisions of the work, including engineering costs as a separate item, itemized in such a fashion as to make possible a comparison of the estimated cost with actual cost encountered for similar work in the past.

Estimates of cost will be required as follows:

A. Submittal of public improvement engineering plans and specifications to the County Engineer for approval;
B. Prior to release of funds from escrow accounts posted as security for payment, performance, and workmanship guarantees by the County Engineer;
C. Prior to reductions in letters of credit posted as security for payment, performance, and workmanship guarantees by the County Engineer; and

D. Submittal of final subdivision plats for approval.

A sample form of the estimate of cost is provided in the Appendix of this manual.

1.09 OTHER PERMIT APPLICATIONS AND APPROVALS

Other governmental agencies may review and approve for construction all or certain parts of the work included in a project and may require a permit or application for a permit for such work. They may also require that such a permit or application for a permit be executed by the County. When such a permit or permit application is required, it shall be prepared by the Design Engineer, ready for signatures and containing all required supporting documentation.

1.10 PUBLIC IMPROVEMENT ENGINEERING PLANS AND SPECIFICATIONS SUBMISSION AND REVIEW PROCEDURE

These documents requiring County approval shall be submitted by the Design Engineer to the Director of Building and Zoning, with a letter of transmittal tabulating the items being submitted. The documents to be approved and the number required by the County are set out below. The Design Engineer shall add to the documents the quantity he would like returned to him marked approved on their face, or in the case of permit applications, executed by the County for submission to other agencies.

The submittal shall be made in two parts. The initial submittal should be made and returned to the Design Engineer prior to the final submittal.

Documents included in the initial submittal are as follows:

A.	Plans	3 sets
B.	Specifications	3 sets
C.	Design computations	1 set

After completion of the review of the initial submittal, the County Engineer will advise the Design Engineer by letter of any items that do not meet the requirements of the Ordinance or this Manual. The Design Engineer may then revise the documents and make the final submission.

Documents in the final submittal shall include the following:

A.	Plans	3 sets
B.	Specifications	3 sets
C.	Estimate	1 set

D. 1/4 size copy of grading plan 1 set

When the final submittal meets all requirements, the County Engineer shall transmit his written approval of the submitted documents to the Design Engineer and the Director of Building and Zoning.

1.11 APPROVAL PERIOD

Approval of the improvement engineering plans and specifications by the County Engineer shall be applicable for a period of three (3) years from the approval of a preliminary subdivision plan. If construction is not commenced within said three (3) year period, the approval will be void. Reactivation of such voided approvals will require a written request to the Committee for extension which will be considered with due consideration given to any new requirements that may be established by the County.

1.12 GUARANTEE BY DEVELOPER

The developer shall guarantee that all work in the project shall be free from defects in workmanship and materials and in conformance with the approved plans and specifications in accordance with the Subdivision Ordinance.

1.13 PLAN REVIEW, INSPECTION AND TESTING FEES

In accordance with the Subdivision Ordinance and prior to the County Engineer transmitting his approval of the public improvement engineering plans and specifications and prior to the recording of the final plat, the developer shall pay to the County a fee of two percent (2%) of the approved estimated costs of such improvements. Said fee shall be applied as credit against the actual costs incurred by the County Engineer for review of said plans and the inspection and testing of said improvements.

The Developer shall pay the balance of the actual costs to the County at the time such review and inspection has been completed by the County Engineer and prior to any acceptance of the improvements for maintenance.

1.14 REVISIONS TO APPROVED PUBLIC IMPROVEMENT ENGINEERING PLANS AND SPECIFICATIONS

Any deviations from approved plans or specifications affecting capacity, stability or operation of the improvements shall be approved in writing by the County Engineer before changes are made. Minor changes not affecting capacity, stability or operation of the improvements will not require formal approval but must be approved by the field inspector representing the County Engineer.

1.15 INSTALLATION AND INSPECTION PROCEDURES

Prior to construction commencing, the Design Engineer/Developer may arrange with the County Engineer a time and place to conduct a pre-construction meeting with representatives of contractors, and utility companies present.

1.16 RECORD DRAWINGS

A. Grading Plan - The Design Engineer shall submit to the County Engineer for approval, a record drawing of the Grading Plan which is required by Section 1.05 of this Manual. The record drawing submitted shall be one clear and legible transparent mylar and one photostatic print of the Grading Plan approved and shall depict actual ground surface elevations on all lot corners and building sites (pads) in addition to the proposed elevations.

B. Public Improvement Plans

The Design Engineer shall submit to the County Engineer, within nine (9) months of acceptance for maintenance, record of the public improvement engineering plans. Final release of the subdivision bond will not be made until the County Engineer has received the record drawings. Record drawings submitted shall be one set of clear and legible transparent mylar, one set of photostatic prints and one digital computer aided drafting file in accordance with the provisions of Section 1.19 of this manual. This submittal shall be of the entire set of the approved public improvement plans and shall depict the improvements as actually installed or constructed.

The Design Engineer will receive from the Highway Department, all inspection reports required to prepare the record drawings adequately. The inspection reports will be available to the Design Engineer after the improvements have been inspected and tested.

1.17 PROJECT COMPLETION AND FINAL ACCEPTANCE

Prior to the County Engineer recommending that the Road District accept the project for maintenance, the County Engineer and the Township Road Commissioner shall make a final inspection of the completed work. The County Engineer shall then prepare a final punch list, itemizing all items not meeting the requirements of the approved plans and specifications. On the completion of all items listed in the final punch list to the satisfaction of the County Engineer and the Township Road Commissioner, the Road Commissioner shall then accept the roads for maintenance.

1.18 WAIVER FOR MANUAL REQUIREMENTS

Where conditions so warrant, and for valid engineering reasons the County Engineer may waive any portion of the requirements of this manual.

1.19 ELECTRONIC DRAFTING FILE STANDARDS

A. Purpose. The purpose of these specifications is to provide a standard for the transfer media and the format of the data files for submission to the County Engineer. The goal is to save the County, consultants and developers time and money by providing a set of CAD (Computer Aided Drafting) standards that will allow for easier referencing and combining of files from one or more designs or sets of field data. By following these standards, files will be uniform allowing for quicker access and editing of files produced at any time or by different people. It will also allow the County to automate the process of adding data to the Geographic Information System.

B. Electronic Files Required. Electronic files shall be provided when submitting final copies of:

1. Engineering Plan Sheets
    a. Title Sheet;
    b. Street plan and profile;
    c. Storm sewer plan and profile;
    d. Sanitary sewer plan and profile; and
    e. Structure plans.
2. Final Plats
3. Record Drawings

C. Media. Files may be submitted on 3 1/2-inch diskette, Iomega 100 MB Zip Diskettes or CD-ROM. Files on floppy may be zipped as long as they are self extracting or the extraction utility is provided. All files and media are to be in an IBM compatible format.

D. CAD Standard. This CAD (Computer Aided Drafting) standard is based on the I.D.O.T. (Illinois Department of Transportation) drafting standards where feasible.

Files submitted shall be AutoCAD DWG files. The files shall have the following properties:

1. The Global Origin shall be set to the lower left of the design plan.
2. Files shall be 3D design files
3. Working units shall be metric. 1000 sub units (mm) per master unit (m). One sub unit per positional unit. Master units shall be designated m for meters. Sub units shall be designated mm for millimeters. Dimensions placed in the design files shall be in English units but the working units shall be metric.
4. The actual working plat or design project shall use Illinois State Plane East Zone Metric coordinates, USGS Zone 3776, FIPS Zone 1201, Projection

will be Transverse Mercator. The USGS Datum will be, horizontal NAD 83 and Vertical NGVD 29. The plat or project shall properly edge match to adjoining plats or designs.

5. Design files shall be compressed, to remove deleted elements before submittal.
6. Reference files used shall be in the same subdirectory as the active design file. The attachment of the reference files done shall be set with "Save Full Path" off. The main working design file shall not contain any reference files.
7. Element attributes/symbology shall be in accordance with the following table:

CHAPTER 2
PROTECTION AND RESTORATION

2.01 Introduction

2.02 Specifications and Special Provisions

2.03 Standard Details

2.01 INTRODUCTION

Public improvements required in connection with a subdivision or development are often in or adjacent to areas with existing surface or underground improvements. This chapter specifies special requirements relative to the construction of proposed improvements and restoration of existing improvements affected by the construction. Plans and specifications presented for approval shall provide for the implementation of the requirements of this chapter.

2.02 SPECIFICATIONS AND SPECIAL PROVISIONS

All public improvement projects shall be completed in accordance with all applicable sections of the most current editions of the Illinois Department of Transportation's "Standard Specifications for Road and Bridge Construction", the "Supplemental Specifications for Road and Bridge Construction", the "Standard Specifications for Water and Sewer Main Construction in Illinois" and any amendments, additions or other requirements contained therein.

A. Protection

1. Traffic Control - All work within the public right-of-way shall be completed in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices" as published by the Illinois Department of Transportation. The provisions of this Manual will be enforced whenever work is in progress within the existing roadway or adjacent to it or as required by the proper highway authority.

   Lane closures will be required whenever construction is performed or vehicles are parked in a lane normally used for through traffic. Written permission for all lane closures must be obtained from the proper highway authority.

Required signing shall be in strict conformance with the manual cited above. No construction shall commence until such time that all required signs and barricades have been erected. The contractor shall also be responsible for contacting police, fire and school authorities of any closure.

2. Bracing and Sheeting - Open cut trenches shall be sheeted and braced as required by any governing federal or state laws and municipal ordinances, and as may be necessary to protect life, property and the work.

3. Trench Side Slopes - The contractor may, where working conditions and right-of-way permit, excavate pipeline trenches with sloping sides only above the top of the conduit.
4. Tunneling - Contractor may utilize short tunnels to avoid obstructions such as trees, fire hydrants, sidewalks and curbs.
5. Stockpiling of Excavated Material - All excavated material shall be stockpiled such that it will not endanger the work and will avoid obstructing streets, sidewalks, driveways, watercourses, fire hydrants, valve pit covers, valve boxes, curb stops and other utility controls.
6. Protection of Property and Structures - Any existing or new property or structures disturbed or damaged during construction shall be replaced or repaired to the satisfaction of the owner, at the contractor's expense.
7. Utilities - The utility companies shall be notified of a proposed project and the plans should indicate the general location of the utility main lines. It shall be the contractor's responsibility before beginning any construction to obtain from all utilities the exact locations of all underground facilities in the area of construction, whether shown on the plans or not. Any facilities disturbed by the contractor shall be repaired at the contractor's expense. J.U.L.I.E. (Joint Utility Location and Identification for Excavators 800-892-0123) is the utility locating service in this area. Any facility disturbed by the contractor shall be repaired at the contractor's expense.

   Businesses and residences shall be notified a minimum of 24 hours in advance of any impending outages. No business or residence shall be without service overnight.

B. RESTORATION

The contractor shall restore all public facilities, including but not limited to, pavements, sidewalks, driveways, curbs, gutters, trees, shrubs, lawn, fences, poles and other structures and property removed or disturbed during or as a result of construction operations to a condition which is equal in appearance and quality to the condition that existed before the work began.

Removal and Replacement of Pavements, Sidewalks, Curbs, Gutters, and Driveways - All removal and replacement shall be completed in accordance with all applicable sections of the "Standard Specifications for Road and Bridge Construction" and any special provisions contained herein. When removal is required for the installation of a conduit, the width of the removal shall exceed the actual trench width by one (1) foot (300mm) on each side. Removal of PCC sidewalk, pavement, driveways, curb and gutter shall be to the nearest joint unless otherwise directed by the Engineer. For all PCC replacements, Class X concrete meeting the requirements of the "Standard Specifications for Road and Bridge Construction" shall be used.

1. Pavement Replacement - The type of removal and replacement shall be classed as follows:

   Type A patches shall apply to pavements that have existing aggregate base and bituminous surface.

   Type B patches shall apply to pavements that have existing concrete base and bituminous surface, brick base and bituminous surface or bituminous base and bituminous surface.

   Type C patches shall apply to existing pavements that have existing brick surface or concrete surface. Reinforcement will be required where the existing pavement is presently reinforced.

   Type D patches shall apply to existing pavements that have existing brick surface that a municipality may have designated to be preserved.

   a. Removal Limits - The limits of the pavement repair shall be saw cut in a rectangular pattern to a depth of not less than three (3) inches (75mm). Type A patches shall be a minimum of three (3) feet (1m) in width. Type B and Type C patches shall be a minimum of five (5) feet (1.5m) in width. For Type B and Type C patches the new pavement shall be shouldered one (1) foot (300mm) minimum on all sides of the excavation on undisturbed ground.

      Whenever a series of Type A or Type B patches are made in such a manner so as to leave less than five (5) feet (1.5m) of undisturbed bituminous surface between adjacent patches, it shall be required that the bituminous surface between the patches be removed and the entire area resurfaced.

      PCC pavements shall be repaired in accordance with the typical detail shown for Type C patching. Whenever a pavement patch is less than four (4) feet (1.3m) from the pavement edge, contraction joint, crack, etc., the pavement patch shall be enlarged to meet the edge, joint or crack and the entire excavated area paved as one patch.

The limits of the pavement removal on all PCC pavements shall be extended to the nearest contraction or expansion joint.

The limits of pavement removal on Type D patching shall be in such a manner that whole bricks will be used in the replacement and that the replaced brick course extends beyond the limits of the concrete base course.

b. Trench Backfill - All utility trenches shall be a minimum of 18 inches (450mm) in width and shall be backfilled with trench backfill. Trench backfill shall be required to a width not less than five (5) feet (1.5m) outside the edge of pavement on streets with a rural cross-section or two (2) feet (.5m) behind the curb for an urban cross-section. Material for trench backfill shall comply with Article 1003.04 of the Standard Specifications. With the approval of the County Engineer, "controlled low strength material" may be used in lieu of aggregate for trench backfill.

c. Compaction of Trench Backfill - Porous granular material shall be placed full width in all utility trenches in layers not to exceed 6 inches (150mm) in thickness and compacted by mechanical means. The porous granular material shall extend to the existing ground level but not higher than the subgrade elevation.
With approval of the County Engineer, the contractor may compact the trench backfill by means of jetting. Should jetting be used, all trenches shall be allowed to dry before any base course or surface may be constructed.

d. Temporary Asphalt Surface - After completion of backfilling the excavation, a temporary asphalt surface shall be placed as soon as possible or as directed by the local highway authority with a minimum thickness of 3 inches (75mm). The excavation contractor shall maintain this surface until the permanent patch is constructed.

e. Traffic Control - Traffic control procedures and guidelines set forth in Section 1084 of the "Standard Specifications for Road and Bridge Construction" and all applicable sections of the "Manual on Uniform Traffic Control Devices" shall be followed to the fullest extent.

    i. On major and collector streets, not more that one-half the width of the street may be closed to traffic except during the actual excavating and laying operations.

ii. Not more than one-half the width of the street may be closed to traffic during the construction and curing of the permanent pavement patch.

Steel plates may be used for Type B patches to bridge the utility trench patch during the curing period for the PC concrete base course in order to open the traffic lane to traffic during this period.

iii. High-Early Strength P.C. Concrete may be used to lessen the curing time from 7 days to 72 hours.

2. Driveway Replacement - The type of replacement required shall depend on the existing type:

a. An existing concrete driveway shall be replaced with a Portland Cement Concrete surface six (6) inches (150mm) thick

b. An existing bituminous surface driveway shall be replaced with an eight (8) inch (200mm) aggregate base and three (3) inches (75mm) of bituminous concrete surface.

c. An existing aggregate driveway shall be replaced with eight (8) inches (200mm) of aggregate with the top four (4) inches (100mm) being the same material as the existing.

3. Sidewalk Replacement - Sidewalk shall be replaced to the same depth and width as the existing unless otherwise directed by the Engineer. One-half (1/2) inch (12mm) thick preformed expansion joints shall be placed at locations abutting existing work and at 50-foot (15m) intervals in the new walk.

4. Curb and Gutter Replacement - Curb and gutter shall be replaced to the dimensions and cross-section as the existing. One-half (1/2) inch (12mm) thick preformed expansion joints shall be placed at the junction of the existing work and at all points of curvature.

5. Field and Drain Tile Replacement - All existing drain tile lines which cross the trench of a proposed sanitary sewer, storm sewer, water main and services shall be accurately recorded and marked in the field by the contractor. Upon completion of the installation of the underground utilities, the contractor shall furnish a copy of all drain tile locations to the Engineer. The Engineer shall analyze these locations and determine if the tiles should be re-connected, connected to the storm sewer or any other tile line which may be in the area or be rerouted through drainage easements to acceptable outlets. All tiles crossing the proposed road right-of-way shall either be replaced and approved by the Engineer or shall be removed to a point five (5) feet (1.3m) outside of the proposed right-of-way line.

All drain tile lines reconstructed or connected to a storm sewer system or collection tile system shall be constructed of either PVC water main with slip-on joints up to twelve (12) inch (300mm) or reinforced concrete storm sewer pipe of Class 3 or Class 4 as required by depth in accordance with the "Standard Specifications for Road and Bridge Construction". Drain tiles not reconnected shall be plugged in an approved manner as directed by the Engineer.

Drain tiles to be reconnected shall be repaired so that their carrying capacity shall not be impaired. Drain tile shall be repaired with PVC SDR 26 pipe, a minimum of two (2) inches (50mm) larger diameter than the severed tile. The length of the plastic pipe shall be such that it bears a minimum of two (2) feet (.6m) on undisturbed soil on each side of the trench, with each field tile to plastic pipe junction encased in concrete, All repairs shall be inspected and approved by the Engineer prior to backfilling. Compacted granular backfill shall be required. The plastic pipe to drain tile junction shall be wrapped with burlap or other material approved by the Engineer prior to encasement to prevent concrete from entering the flow line of the pipe.

6. Restoration of Vegetative Areas - All vegetative areas disturbed during construction shall be restored by furnishing and placing topsoil to a minimum depth of four (4) inches (100mm) and seeding and mulching of the area in accordance with the "Standard Specifications for Road and Bridge Construction" or other written specifications or as directed by the Engineer.
7. Cleanup - Before acceptance of underground conduit construction, all pipes, manholes, catch basins, fire hydrants, and other appurtenances shall be cleaned of all debris and foreign material.

C. SPECIAL PROVISIONS MODIFYING STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS

20-2.18 Construction in Easements - Add the following:

The top six (6) inches (150mm) of any ground disturbed due to construction on private property in an inhabited area shall be replaced with topsoil and restored to its original condition.

20-2.18 A. AGRICULTURAL SURFACE RESTORATION

At locations as shown on the plans or designated by the Engineer, the contractor shall restore any and all agricultural areas. Prior to the installation of the proposed pipes, the contractor shall remove all topsoil from the construction area and stockpile it along the edge of the working limits.

Upon the completion of the installation of the pipes and placing of the subsoil backfill, the contractor shall replace the original topsoil over the top of the disturbed area so that the finished surface shall be level and smooth and contain all of the original topsoil at approximately the same depth as prior to construction.

20-2.18 B. REMOVAL OF SOIL FROM AGRICULTURAL AREAS

No soil will be removed from the areas designated for agricultural surface restoration without the express written consent of the owner or his designated representative.

CHAPTER 3

GENERAL SUBDIVISION DESIGN STANDARDS

3.01 INTRODUCTION

All subdivisions shall be designed to conform to the planning principles, layout and design requirements of this section of the Manual. These principles and design requirements concern entire systems rather than individual elements of the system, and so express concepts rather than specific standards. Specific standards are elaborated in other chapters of this manual.

3.02 SUBDIVISION PRINCIPLES OF PLANNING

Basic principles exist which should be recognized and heeded in designing circulation and access patterns in new subdivisions of conventional layout.

Basic consideration in the design of local circulation systems must recognize the factors of: (1) Safety - for both vehicular and pedestrian traffic, (2) efficiency of service - for all users, (3) livability or amenities - especially as affected by traffic elements in the circulation system, and (4) economy - of both construction and use of land.

Each of the following principles is an elaboration on one or more of these four factors. The principles are not intended as absolute criteria since instances may occur where certain principles conflict. The principles should, therefore, be used as guides to proper system layout.

A. Adequate vehicular access should be provided to all parcels.
B. Local street systems should be designed to minimize through-traffic movements.
C. Street patterns should minimize "out-of-the-way" vehicular traffic.
D. Local street systems should be logical and comprehensible, and systems of street names and house numbers should be simple, consistent and understandable and not duplicate any existing street name recorded in the office of the County Recorder.
E. Local circulation systems and land development patterns should not detract from the efficiency of major and collector streets.
F. Elements in the local circulation system should not have to rely on extensive traffic regulation in order to function efficiently and safely.
G. Traffic generators within residential areas should be considered in the local circulation pattern.
H. Planning and construction of residential streets should clearly indicate their function.
I. The local street system should be designed for a relatively uniform low volume of

street traffic and to discourage excessive speeds.

J. Pedestrian-vehicular conflict points should be minimized.

K. A minimum amount of space should be devoted to street uses.

L. There should be a minimum number of intersections.

M. The arrangement of local streets should permit economical and practical patterns, shapes and sizes of development parcels.

N. Local streets should be related to topography from the standpoint of both economics, drainage and amenities.

O. Open space areas should be provided, commensurate with the projected population density of the development.

P. The street and pedestrian circulation pattern in a new residential subdivision shall be compatible with any land use plan adopted by the County.

Q. A residential area should be conveniently accessible from major streets, however, access points should be limited in number and given special design consideration, and whenever possible, located where other features are not competing for driver attention.

R. Driveways should be prohibited on arterial and collector streets in residentially zoned areas.

S. Except in extreme cases, subdivisions shall be designed with two or more access points.

T. A satisfactory relationship between proposed and existing development should be established in order to permit efficient and economic continuity of utilities and services.

U. Public utilities should be existing or proposed by the developer of a size adequate to serve the proposed subdivision and any other future development they may be required to service.

V. The general land use principles and planning standards should be applied to the subdivision as contained in any land use plan adopted by McLean County.

W. The use of a cul-de-sac street shall be limited to situations where the natural topography or other factors dictate its use as the best engineering or design option.

X. Interconnection with other developable land that adjoins the subject property shall be provided.

3.03 LAYOUT AND DESIGN REQUIREMENTS FOR PROPOSED LOTS OF RECORD AND OUTLOTS

A. Subdivisions shall consist solely and exclusively of lots of record, outlots, easements, public rights-of-way and public improvements.

B. All proposed lots of record shall front on and have access to a public street or roadway except as follows:

1. Lots within a Planned Unit Development, as allowed, in accordance with regulations of the McLean County Zoning Ordinance.
2. One (1) new lot resulting from the division of a tract of land containing

twenty (20) acres (8 hectares) or more may have access to a public street by an easement of not less than twenty-five (25) feet (8m) in width provided that such lot contains one (1) permanent dwelling which existed at such location on the effective date of this Ordinance and provided that no boundary of said new lot shall be nearer than two hundred (200) feet (60m) to the right-of-way line of any public street.

C. All proposed lots of record shall meet or exceed the lot size, dimension and area requirements of any applicable zoning regulations of the County of McLean.

D. Outlots may not be built upon or developed except as provided by the McLean County Zoning Ordinance.

E. Rear, side and front yard easements shall be for the use of public and private utility companies (gas, electricity, cable tv, water, sewer, etc.) as provided herein.

F. Where residential lots are abutting a collector or major street, a "no access strip" shall be depicted on such lots to prohibit vehicular access directly to such abutting collector or major street. A "no access strip" shall also be required for a distance of fifty (50) feet (15m) in each direction from any interior street intersection.

G. Boundaries of the subdivision shall be drawn to meet or exceed the following standards:

1. Error of closure of boundary line surveys shall not exceed 1:5000;
2. Angular error shall not exceed $\pm$ 20 seconds;
3. Lot line dimensions shall be shown in feet and hundredths (meters and thousandths of a meter) and;
4. Angles occurring in any lot line between lot corners shall be shown in degrees, minutes and seconds; and
5. Chord distances shall be shown either on the plat or on a table on a supplemental sheet.

H. In general, lots shall be as nearly rectangular in shape as practicable.

I. Dimensions of corner lots shall be large enough to allow for erection of buildings, observing the minimum front yard building setbacks required by the McLean County Zoning Ordinance from both streets.

J. Lot depths, widths, and setbacks shall conform to the requirements set forth in the McLean County Zoning Ordinance.

K. Depth and width of lots reserved or laid out for business, commercial, or industrial purposes shall be adequate to provide off-street parking facilities required for the type of use and development contemplated as regulated by the McLean County Zoning Ordinance.

L. Side lot lines shall generally be perpendicular to the right-of-way line and shall be designated as such when not perpendicular.

A. When a proposed subdivision borders undeveloped properties that could be developed, connecting stub streets shall be provided to adjacent properties so as to allow for a reasonable interconnecting street pattern.

A. When a proposed subdivision borders on a property that has a county-approved preliminary plan or final plat, the proposed subdivision shall connect to all existing or proposed stub connections.

O. When a developer wishes to final plat a proposed subdivision in phases from an approved preliminary plan, he shall, after final platting fifteen lots or twenty -five percent (25%) of the lots on the approved preliminary plan, whichever is less, provide a second completed connecting entrance to the subdivision. At the time a total of seventy percent (70%) of the lots on an approved preliminary plan is being final platted, the developer shall complete all connecting street improvements as approved in the preliminary plan.

3.04 LAYOUT AND DESIGN REQUIREMENTS FOR BLOCKS

A. In residential subdivisions containing lots of less than one hundred fifty (150) feet in width the maximum block length shall not exceed one thousand two hundred (1200) feet. In subdivisions containing lots of one hundred fifty (150) feet or more the maximum block length shall not exceed two thousand (2000) feet. No blocks shall be less than three hundred (300) feet in length. Whenever practicable, blocks along major streets, collector streets, and arterial streets shall not be less than one thousand two hundred (1200) feet in length. In business or manufacturing districts the Committee shall determine the length of blocks.

B. The shape of blocks shall be determined by topographical features, the basic street system and traffic patterns, lot depths, and areas designated for public and other non-residential land uses.

C. Where a subdivision borders upon or is traversed by a railroad right-of-way, the Committee may require a street on one (1) or both sides of such right-of-way located approximately parallel to and at a distance removed from said right-of-way. The use of the intervening property shall be appropriate for the zoning district.

CHAPTER 4
DESIGN AND CONSTRUCTION STANDARDS FOR STREETS

4.01 Introduction

All lots in any subdivision, regardless of size, shall front on and have access to a public or private street. When necessary, streets shall be included as part of the subdivision and shall be designed in accordance with this chapter.

4.02 General Requirements

All subdivisions shall be designed so the proposed street system meets the following:

A. Conforms to the Comprehensive Plan of McLean County.
B. Extends major and collector streets through the proposed subdivision.
C. Locates and aligns local and cul-de-sac streets so that use by through traffic is discouraged.
D. Avoids centerline off-sets of less than 250 feet (75m) for local streets. On collector and arterial streets a detailed traffic study may be required.
E. Where the angle of deflection of a horizontal centerline is greater than two degrees, a curve shall be inserted with a radius meeting IDOT standards, except a local street with a 90° corner may have a minimum centerline radius of ninety (90) feet (30m).
F. No more than two (2) streets shall intersect at any point and so that the angle of intersection of centerlines is not less than 80 degrees nor greater than 100 degrees.
G. Provide a minimum turning radius of twenty-five (25) feet at the intersection of two streets in a residential subdivision. In all other zoning classifications or at the intersection of a local street with a collector or arterial road the County Engineer shall determine the minimum radius.
H. In a single-family zoning district a cul-de-sac shall not exceed 1200 feet (360m) in length or have more than 15 lots fronting thereon, whichever imposes the more demanding standard and in other zoning districts a cul-de-sac shall not exceed 400 feet (120m) or have more than 8 lots fronting thereon, whichever imposes the more demanding standard.
I. Encourage safe and efficient traffic flow and provide sufficient vehicular storage space for stopping and turning movements so as not to conflict with traffic at intersecting streets or driveway entrances.
J. A subdivision shall have at least two means of vehicular access.
K. When a proposed subdivision borders undeveloped property which could be developed, connecting streets shall be provided to these properties so as to allow for a reasonable interconnecting street pattern.
L. When a proposed subdivision abuts property that has an approved preliminary plan or final plat, the proposed subdivision shall connect to all existing or proposed connecting streets.
M. The use of cul-de-sacs in a subdivision shall be limited to situations where the natural topography or other factors dictate its use as the best engineering or design

option.

B. The County Board may require the developer to provide for an arterial or collector street through the subdivision if it deems the arterial or collector necessary in order to provide adequate access to the area in which the development is proposed.

C. All streets shall be designed using concrete curb and gutter.

4.03 Public Street Right-of-Way Dedication

A. All public streets and roadways proposed within the confines of a subdivision shall be located in dedicated public right-of-way as required by this section.

B. All public subdivision streets shall be located within public rights-of-way and shall conform to the minimum requirements of its classification as described in the following table.

Classification	Residential	Commercial and Manufacturing
Arterial w/curb	120'	100'
Collector w/curb	80'	80'
Local w/curb	60'	60'
Cul-de-sac Terminus w Curb	130'	130'

C. The subdivider shall provide not less than one-half of the right-of-way required for the construction or upgrade of an adjacent street.

D. When this ordinance requires turning lanes, turning radii, center median, traffic control devices or other installation which cannot be installed within the right-of-way otherwise required by this Ordinance without the elimination or conflict between such features and other public improvements, the subdivider shall dedicate such additional right-of-way as is necessary to accommodate all such improvements.

E. When a subdivision is situated along a street proposed as part of a land use plan, the subdivider shall provide not less than one-half of the required right-of-way.

4.04 Design Standard

A. Pavement width shall be based on street classification, the expected traffic volume and the zoning district, whichever is the more demanding, in accordance with the following:

Street Classification	Residential	Commercial or Manufacturing
Arterial - over 850 DHV	2-24' w/ 14' median	2-24 w/ 14' median
Arterial - under 850 DHV	38'	38'
Collector	38'	38'
Local	30'	30'
Boulevard	22'	22'

The width of a curb and gutter street shall be measured from face of curb to face of curb.

B. Pavement Structure

Pavement thickness shall be determined by IDOT structural design formulas with the following minimum requirements:

1. For roadways having a Bituminous Concrete surface, the minimum base thickness shall be 10" of compacted CA-6 or CA-10. The minimum surface shall be 3" of Class I bituminous concrete.
2. For roadways having a Portland Cement Concrete surface, a minimum thickness of 6" (150mm) shall be required.
3. All streets in commercial or manufacturing districts shall be concrete or full depth asphalt construction with the thickness based upon the estimated traffic.

C. Materials and Method

Streets shall be constructed in accordance with all design and construction standards outlined in the following:

1. Illinois Department of Transportation "Design Manual"
2. Illinois Department of Transportation "Highway Standards"
3. Illinois Department of Transportation "Standard Specifications for Road and Bridge Construction"

D. Cul-de-Sac Terminus

A cul-de-sac terminus shall have a minimum right-of-way diameter of one hundred forty (140) feet (42m) and a pavement diameter of one hundred two (102) feet (16m) where a rural cross-section is used. Where an urban cross-section is used, the right-of-way diameter shall be one hundred thirty (130) feet (39.5m) and the pavement diameter shall be one hundred ten (110) feet (33.5m) measured face-to-face of curb.

E. Vertical Gradients

Differing connecting street gradients shall be connected with vertical curves. The "Design Manual" shall govern all vertical curve computations, except when the algebraic difference of the gradient is less than one (1) percent, a fifty (50) foot (15m) vertical curve length shall be utilized. Street gradients for curb and gutter streets shall be a minimum of five tenths of one percent (.5%).

F. Curb and Gutter

1. Curb and gutter shall be Type B-6.18 in accordance with the "I.D.O.T. Highway Standards" and installed in accordance with the "Standard Specifications of Road and Bridge Construction".
2. In any subdivision where sidewalks are provided, all curb and gutter shall be designed so as to allow wheelchairs to travel freely and without assistance. At each crosswalk a ramp shall be installed with a non-slip surface so that the sidewalk and street blend to a common level. These ramps shall be designed and constructed in accordance with the "Highway Standards".
3. In all subdivisions having lots with ten thousand (10,000) square feet or less, curb and gutter edging shall be installed.

G. Signing

1. Where required, all regulatory and advisory signs shall be installed in accordance with the Manual on Uniform Traffic Control Devices.
2. All stop signs shall be installed on 4"x6" treated wooden posts. All other signs shall be installed on 4"x4" treated wooden posts.
3. All signs shall be of hi-intensity grade reflective material.

4.05 Specifications and Special Provisions

All streets and curb and gutter shall be constructed in accordance with all applicable sections of the Illinois Department of Transportation's "Standard Specifications for Road and Bridge Construction" , the current edition as may be modified, supplemented and amended by this Manual or the County Engineer. These modifications, amendments and amplifications have been provided in this Chapter of the Manual.

<u>Street Special Provisions</u>

Curb Marking of Water and Sewer Services - At the time any curb and gutter is poured, the contractor shall mark the top of the curb with an "S" or "W" for sewer and water services respectively.

Adjustment of Frame and Grate - Final grade for all manhole castings will be determined after the curb and gutter has been poured and the subgrade and/or base has been constructed. Final adjustment of the frame and grate shall be made in the following manner: After the curb and gutter has been poured and the base constructed, the final elevation will be determined by the Engineer. The frame and grate will be adjusted to this elevation in accordance with the Standard Specifications. Any material disturbed while adjusting the frame and grate will be disposed of and all fill made with lean concrete. A maximum of eight (8) inches (200mm) of adjusting rings shall be allowed.

Coarse Aggregate - All coarse aggregate for concrete shall be crushed stone. Gravel, crushed gravel and crushed slag shall not be allowed.

Combination Concrete Curb and Gutter - Concrete curb and gutter shall be sawed or scored at intervals coinciding with the joint intervals of the adjoining pavement. The minimum joint depth for the gutter shall be two (2) inches (50mm), and one (1) inch (25mm) for the curb. The curb and gutter may be jointed instead of sawed provided the stated joint depths are obtained. If the curb and gutter is adjacent to bituminous pavement it shall be jointed at fifteen (15) foot (5m) intervals.

The sawing of the curb and gutter shall commence within four (4) hours of the start of the pour unless otherwise directed by the Engineer. Sawing shall continue until all joints are completed or until sunset, whichever comes first. If all joints are not completed by sunset, sawing shall resume at sunrise and continue until completed.

Asphaltic type expansion joints one (1) inch (25mm) thick shall be placed at all P. C., P.T. and R.P. C points and at 500' (150m) minimum intervals.

Test Rolling of Subgrade and Base Course - The contractor will provide at his own expense a loaded truck and test roll the compacted subgrade in the presence of the Engineer or his/her designee before any sub-base, or surface is placed. The truck shall be loaded as follows: 27,000 pounds (12,250kg) on two axles and 45,000 pounds (20,500kg) on three axles, plus or minus ten percent. The truck shall make one pass over the entire length of each traffic lane to be constructed. Areas that show rutting, cracking or rolling will not be accepted; the contractor will recompact and/or reconstruct the sections that fail and test roll again for acceptance.

When bituminous or concrete surface courses are to be placed over an aggregate base, the base shall be test rolled prior to placement of the surface course.

Portland Cement Concrete Pavement - Sawed transverse joints shall be not be greater than 2.5 times in feet, the thickness in inches of the pavement apart and shall conform with the details in the plans. All equipment and labor required to perform the necessary jointing operation shall be available to begin sawing no later than four (4) hours after the paving operation begins, unless excess raveling occurs. The contractor shall provide the necessary equipment and labor needed to complete the sawing at the same rate per longitudinal foot as the paving operation.

The contractor shall stop paving operation a 4:30 P.M. unless otherwise approved by the Engineer. Sawing shall continue at the same rate as stated above until sunset. If joints are not completed by sunset, sawing shall commence at sunrise and continue at the same rate as the previous day until all joints are completed.

Trucks and mixer trucks will be allowed to operate on the subgrade; however, should the subgrade show any signs of distress, all operations will cease until these items are corrected to the satisfaction of the Engineer. Curb and gutter is to be formed in a separate operation from the pavement. Monolithic curb will not be permitted.

Final finish shall be Type B, except a burlap drag may be substituted for the artificial turf drag.

Portland Cement Concrete Driveway Pavement - Pavement shall be a minimum of six (6) inches (150mm) in depth. Sawed transverse and longitudinal joints shall conform to the following:

Driveway at Widest Point	No. of Longitudinal Cuts
0' - 12'	0
13' - 24'	1
25' - 36'	2

Driveway Length	No. of Transverse Cuts
0' - 12'	0
13' - 24'	1
25' - 36'	2

The sawed joints shall be spaced evenly throughout the driveway. The joints shall be 1/8 inch (3mm) wide with a minimum depth of 1/4 inch (6mm)and sealed with the same material and in the same manner as Portland Cement Concrete Pavement. Expansion joint a minimum of 3/4 inches thick (18mm) shall be placed between the driveway pavement and sidewalks and between driveway pavement and curb and gutter.

4.06 STANDARD DETAILS

Chapter 5
Design and Construction Standards for Sidewalks and Pedestrian Ways

McLean County does not require sidewalks in its subdivisions and therefore does not provide standards for their installation. Should a subdivider wish to install sidewalks in his subdivision, these sidewalks will be installed on private property and not in the street right-of-way. It is recommended that if these sidewalks are installed that the owner meets all ADA standards that are required.

Chapter 6

Design and Construction Standards for Storm Sewers, Drainageways & Storm Water Detention Facilities

6.06 Standard Details

6.01 INTRODUCTION

No subdivision plan or plat shall be recommended for approval, which does not make adequate provision for storm or flood water runoff channels or basins. The storm water drainage system shall be separate and independent of any sanitary sewer or collection tile system. Storm sewers, where required, shall be designed by the Rational Method or any other reasonable method as approved by the County Engineer. A copy of all design computations shall be submitted along with the engineering plans. Underground and/or surface storm water drainage systems shall be installed to service the entire subdivision. On site stormwater detention/retention shall be provided unless otherwise approved.

6.02 Design Standards

All subdivisions shall include a storm water drainage system designed in such a way to provide that all lots and outlots in the subdivision will be graded and shaped so as to provide an adequate outlet for that property. This drainage system shall provide for any drainage that naturally flows through the development from adjoining property.

A. Storm Sewers

1. Design Criteria

a. Design Formula - Unless otherwise approved by the County

Engineer, formulas to be used in connection with the calculation of run-off reasonably expected from the minimum design storm shall be the Rational Method for total contributing areas of twenty (20) acres (8 hectares) or less and the Soil Conservation Service Method as outlined in their Technical Release No. 55 for areas greater than twenty (20) acres (8 hectares). Calculations are to be submitted substantially in the form provided in Exhibit P of the Appendix.

b. Minimum Design Storm - The minimum design storm used in calculating run-off in the Design Formula will be the average rainfall intensity associated with an average recurrence interval of five (5) years for the storm period calculated by the Time of Concentration as outlined by the latest Technical Letters of the Illinois State Water Survey for rainfall frequencies. The corresponding charts and tables have been provided in Exhibit P of the Appendix for time of concentration, run-off factors and coefficients and frequency intensities for use in either method for run-off estimation.

c. When changing sewer sizes the sewers shall match at the 9/10 diameter point.

2. The stormwater drainage system shall connect all inlets and catch basins to a storm sewer, pipe or conduit of sufficient size, grade and capacity to carry the run-off reasonably expected from the Minimum Design Storm on the area in the natural drainage area if that area is improved with the type of improvements permitted and to a maximum density authorized by the then-existing zoning ordinances of the County for property within the jurisdiction of the County; however no storm sewer shall be smaller than twelve (12) inches (300mm) in diameter.

3. The stormwater drainage system shall connect all storm sewers to other storm sewers or improved drainageways of sufficient size, grade, and capacity to carry the runoff reasonably expected from the Minimum Design Storm in the natural drainage area if that area was improved with the type of improvements permitted and to the maximum density authorized by the then-existing zoning ordinances of the County for property within the jurisdiction of the County.

4. Manholes

a. Public manholes shall be installed at the end of each storm sewer line, at all changes in grade or alignment, at all intersections and at distances not greater than 400 feet (120m) between manholes for sewers of 15 inches (375mm) or less and 500 feet (150m) for sewers of 18 to 30 inches (450mm-750mm). Greater spacing will be permitted in larger sewers and in those carrying a settled effluent.

b. Public manholes in improved streets or other hard surfaced public rights-of-way accessible to vehicular traffic shall be not more than 800 feet (360m) apart or at such lesser distances as is required to permit every storm sewer in the proposed development to be inspected, tested and cleaned from two surfaced manholes separated by not more than 1,200 feet (360m) measured in a straight line along the sewer.

c. Minimum drop in a manhole shall be 1 inch (25mm) and the maximum drop in a manhole shall be 24 inches (600mm).

5. Inlets

Inlets for local streets shall be provided for all low points and the maximum spacing shall not exceed four hundred (400) feet (120m), except that the first inlet shall be spaced approximately four hundred feet from the high point or at no greater distance than six hundred (600) feet (180m) when approved by the County Engineer. Inlets for all other street classifications shall meet IDOT design criteria.

B. Drainage Ways

1. All drainage ways through the proposed development shall be improved to a size and in a way adequate to carry the runoff reasonably expected from the Minimum Design Storm in the natural drainage area if that area was improved with the type of improvements permitted and to the maximum density authorized by the then-existing zoning ordinances of the County for property within the unincorporated areas of McLean County and the land use element of the County's Comprehensive Plan.

a. Design Formula: Unless otherwise approved by the County Engineer, formulas to be used in connection with the calculation of runoff reasonably expected from the Minimum Design Storm shall be the Rational Method for total contributing areas of 20 acres (8 hectares) or less and the Soil Conservation Service Method as outlined in their Technical release No. 55 for areas greater than 20 acres (8 hectares).

b. Minimum Design Storm: The Minimum Design Storm used in calculating runoff in the Design Formula will be the average rainfall intensity associated with an average recurrence interval of twenty-five (25) years for the storm period calculated by the Time of Concentration as outlined by the latest Technical Letters of the Illinois State Water Survey for rainfall frequencies. The corresponding charts and tables have been provided in Exhibit P of the Appendix for Time of Concentration, runoff factors, and coefficients and frequency intensities for use in either method for runoff estimation.

2. Drainage ways shall have a flat bottom, maximum 3:1 side slopes, the top of the bank shall be constructed one foot above computed water surface elevation for the Minimum Design Storm, and have a ten (10) foot (3m) maintenance/access lane on each side of the drainage way.

C. Retention and Detention Facilities

1. No development shall be authorized in McLean County unless it has an approved on-site detention or retention facility. Such facility shall be designed based on the Design Formula.
   a. Design Formula: Unless otherwise approved by the County Engineer, formulas to be used in connection with the calculation of runoff volumes and allowable release rates reasonably expected from the Minimum Design Storm shall be the Rational Method as outlined of the latest Illinois Division of Highway Standards for the Storm Water Runoff and the method outlined by the Metropolitan Sanitary District of Greater Chicago's sewer permit ordinance of 1972 as modified in Exhibit P of the Appendix for Storage for total contributing areas of twenty (20) acres (8 hectares) or less and the Soil Conservation Hydrograph Method for areas greater than twenty (20) acres (8 hectares). The corresponding instructions, charts, tables and forms have been provided in Exhibit P of the Appendix of this Manual for use in either method of calculation. For areas of development up to five (5) acres (2 hectares), the following shall be required.

AREA	REQUIRED STORAGE RATE	MAXIMUM RELEASE RATE ALLOWED
up to 1 acre (0.4 hectare)	10700 cu. ft/acre (750 cu. m/hectare)	1.05 cfs/ acre (0.073 cu. m/hectare)
up to 2 acres (0.8 hectare)	9100 cu. ft./acre (640 cu. m/hectare)	0.90 cfs/ acre (0.063 cu. m/hectare)
up to 3 acres (1.2 hectare)	7800 cu. ft./acre (545 cu. m/hectare)	0.78 cfs/ acre (0.055 cu. m/hectare)
up to 4 acres (1.6 hectare)	6900 cu. ft./acre (480 cu. m/hectare)	0.64 cfs/ acre (0.045 cu. m/hectare)
up to 5 acres (2.0	6200 cu. ft./acre (435 cu.	0.60 cfs/ acre (0.042 cu.

hectare)	m/hectare)	m/hectare)

b. Minimum Design Storm:

i Storage volume will be determined from inflow hydrographs generated by the Design Formula using a minimum design storm with a range of rainfall intensities associated with an average occurrence interval of one hundred (100) years and an assumed coefficient for the post development zoning district as set forth in Exhibit P of the Appendix of this Manual.

ii Allowable release rate will be determined by the Design Formula using a minimum design storm with an average rainfall intensity associated with an average recurrence interval of three (3) years for the storm period calculated by the Time of Concentration as outline by the latest Technical Letters of the Illinois State Water Survey for rainfall frequencies and a runoff coefficient of 0.25.

2. Bank Stabilization

a. Retention facilities shall be provided with wave shelves along the entire perimeter in accordance with standards in this manual.

b. Retention and detention facilities shall have a maximum 4:1 bank slope.

c. Shoreline surfaces subject to wave action shall be stabilized with structural material such as riprap, revetment matting, retaining walls, etc.

6.03 DESIGN CALCULATION REQUIREMENTS

Calculations required to demonstrate compliance with the design standards enumerated in the previous section of this Manual shall be submitted substantially in the form and content as shown and provided in Exhibit P of the Appendix. Calculations submitted with Preliminary Plans are not required to be of greater detail as the calculations required to be submitted with Public Improvement Engineering Plans and Specifications.

6.04 RIGHT-OF-WAY AND EASEMENT DEDICATIONS

A. Drainage Ways All drainage ways shall be located in dedicated public rights-of-way. Rights-of-way for drainage ways shall be a minimum of one hundred (100) feet (30m) wide. This minimum width shall be increased if the County Engineer shall determine that the drainage way's hydraulic capacity is inadequate to properly serve its drainage function.

B. Storm Sewers Storm sewers shall be located in public easements or dedicated public rights-of-way. Such easements and rights-of-way shall be of sufficient width and the storm sewer shall be installed at such locations therein as to permit open cut installation, maintenance and repair within the confines of the easement or right-of-way without relocation or other unreasonable interference with other semi-public utilities located therein and so as to meet the following minimum standards:

1. Fifteen (15) feet (5m) in width plus five (5) feet (1.5m) for each additional utility for storm sewers twenty four (24) inches (600mm) in diameter or less.
2. Two (2) additional feet (.5m) in width for each twelve (12) inches (300mm) or portion thereof, of additional storm sewer diameter provided in excess of twenty four (24) inches (600mm); and
3. Additional width may be required if storm sewers exceed fifteen (15) feet (5m) in depth.

6.05 SPECIFICATIONS & SPECIAL PROVISIONS

A. Storm Sewers Storm sewers shall use materials and be installed in the manner meeting or exceeding the requirements, standards, and specifications contained in the Standard Specifications for Water and Sewer Main Construction in Illinois, the current edition as then modified, supplemented and amended by this Manual or the County Engineer. These modifications, amendments and applications have been provided in this Chapter of the Manual.

B. Drainage Ways & Detention or Retention Facilities These shall be constructed in the manner meeting or exceeding the requirements, standards and specifications contained in the applicable sections of the "Standard Specifications for Road and Bridge Construction" for the Illinois Department of Transportation, the current edition as then modified, supplemented and amended by this Manual or the County Engineer. These modifications, amendment and applications have been provided in this Chapter of the Manual.

C. Special Provisions Modifying Standard Specifications for Water and Sewer Main Construction in Illinois.

20-2.21 B. BACKFILL ABOVE CENTERLINE OF PIPE

Add the following ahead of 20-2.21 B. (1):

BACKFILL ABOVE CENTERLINE OF PIPE TO AN ELEVATION 1 FOOT (300MM) ABOVE TOP OF PIPE:

Pipe Sewers: Vitrified extra strength clay pipe and PVC pipe shall be backfilled from the top of the granular cradle at the spring line of the pipe, to a level one (1) foot (300mm) above the top of the pipe with granular backfill or carefully placed select backfill. Trench backfill shall be required under all pavements to a width of two (2) feet (300mm) outside of curb or five (5) feet (1.5m) outside edge of pavement.

Water Mains and Sewer Force Mains: Ductile Iron and PVC pipe shall be backfilled with select excavated material, free from clods or stones, or with granular backfill to a level one (1) foot (300mm) above the top of the pipe. Trench backfill shall be required under all pavements to a width of two (2) feet (300mm) outside of curb or five (5) feet (1.5m) outside edge of pavement.

30-3.01 F Ductile Iron Pipe
Add:

Inside of all pipes shall have standard cement mortar lining and the inside and outside shall be tar (seal) coated.

32-2.07 Cast Iron Frames, Cover and Steps]

Add:

Covers shall be Neenah, East Jordan or equal. Neenah numbers are given as examples.

For Storm Manholes: Standard Type 1 Frame and Grate - Neenah R-2077 L with Type "A" Grate.
Steps shall be M.A. Industries PS1-PF Manhole Step or equal conforming to ASTM C-478.

32-3.05 PRECAST MANHOLES

Add to paragraph 3:

No bitumastic material shall be used on the inside of manholes. Inside of all joints shall be furnished with non-shrink type grout and rubber gaskets.

32-3.09 PLACING CASTINGS

Change to read:

Castings placed on concrete or masonry surfaces shall be set in a full mortar bed or on approved solid bituminous gaskets.
32-3.09A STREETS AT GRADE

Change 12 inches to 8 inches.

32-3.09B STREETS OR ALLEYS WITH NO ESTABLISHED GRADE

Change 12 inches to 8 inches.

32-09C MANHOLES NOT WITHIN STREET OR ALLEY AREAS

Change 18 inches to 24 inches.

Change second paragraph to read:

Unless otherwise directed, the top of manhole castings shall be at grade of existing surface.

32-3.11 PIPE CONNECTIONS
Add:

Bituminous material shall be used on the outside of the manhole only.

A. Storm Sewer Special Provisions

Adjustment of Frame and Grate: Final grade for all manhole castings will be determined after the curb and gutter has been poured and the subgrade and/or base has been constructed. Final adjustment of the frame and grate shall be made in the following manner: After the curb and gutter has been poured and the base constructed, the final elevation will be determined by the Design Engineer.

The frame and grate will be adjusted to this elevation in accordance with the Standard Specifications. Any material disturbed while adjusting the frame and grate will be disposed of and all fill made with lean concrete. A maximum of eight (8) inches (200mm) of adjusting rings shall be allowed.

Materials: Material for storm sewers shall be reinforced concrete culvert storm drain and sewer pipe, AASHTO M-170, or concrete sewer drain and culvert pipe, AASHTO M-86, with the class as being specified under the various types in Article 603.03 of the IDOT Standard Specifications for Road and Bridge Construction or ductile iron pipe class 150. Joints shall be mastic or preformed gasket type. Other types of materials for storm sewer will not be allowed.

Compaction of Trenches: All sewer trenches under paved surfaces shall be compacted by mechanical means unless otherwise directed by the County Engineer.

Granular Cradle: A granular cradle will be required for all storm sewers as shown in the Standard Details. Material for the granular cradle shall comply with either Type A or C gradations.

Trench Backfill: Trench Backfill shall comply with Section 208 of the Standard Specifications for Road and Bridge Construction. All trenches under another sewer or water main, or under existing or proposed streets, sidewalks, driveways and curb and gutter shall be backfilled with material as specified in Section 1003.04 of the Standard Specifications.

Inlet Type A w/ Type 3 Frame and Grate: Section 602 shall govern the construction of Inlets Type A. They shall be built in accordance with the Standard Details for Inlets Type A. Section 604 of the Standard Specification shall govern the construction of Frame and Grate Type 3. Frame and Grate Type 3 shall be equal to Neenah No. R-3010. The curb box shall be of the open type and the grate shall be Type A. Only cast iron grates shall be used.

Inlet Type H w/ Type 50 Frame and Grate: Section 602 shall govern the construction of Inlets Type H. They shall be built in accordance with the Standard Details for Inlets Type H. Section 604 of the Standard Specifications shall govern the construction of Frame and Grate Type 50. Frame and Grate Type 50 shall be equal to Neenah No. R-3067-CC. Grates shall be Type A. Only cast iron grates shall be used.

6.07 STANDARD DETAILS

Standard Drawing

CHAPTER 7
Design and Construction Standards for Sanitary Facilities

7.01 INTRODUCTION

The private sewage disposal systems for all subdivisions under the jurisdiction of McLean County shall meet the requirements of the Illinois Private Sewage Disposal Licensing Act and Code and the McLean County Code, Chapter 28, Article II, Private Sewage Disposal Systems or as outlined in this chapter.

7.02 GENERAL REQUIREMENTS

A. In developments where private sewage disposal systems are proposed, the developer must ensure that the portion of each building lot intended for the installation of the private sewage disposal system be left in an undisturbed condition;

B. Before a building permit can be issued the absorption capacity of the soil shall be determined by either a soil investigation by a certified soil classifier or by percolation tests;

C. The Developer shall provide access to a IDPH common collector, a tile having a combined flow of less than fifteen hundred (1500) gallons (6000L) per day, or a IEPA common collector, a tile having a combined flow of fifteen hundred (1500) gallons (6000L) or more per day;

D. All common collectors shall have the capacity to drain that portion of the subdivision it is intended to drain;

E. Maintain separation from a public or private water supply;

F. Provide areas for possible tertiary effluent treatment facilities to serve common collectors which are regulated by the IEPA. These facilities shall be located on outlots and not as part of any lot of record. These areas shall have adequate access to allow installation and maintenance of the treatment facility.

G. An acceptable discharge for all common collectors shall be provided.

1. A IDPH common collector may be discharged into a river or stream which provides more than a 5:1 ratio based on a 7 day, 10 year low flow rate; or into a lake or pond with the maximum allowable discharges not to exceed two (2) per one (1) acre of surface area of the lake or pond. Discharges shall have as much separation as possible to allow for maximum dilution capabilities.

2. A IEPA common collector must have a National Pollution Discharge Elimination System permit from IEPA. A copy of this permit must be on file with the McLean County Health Department.

7.03 DESIGN REQUIREMENTS

A. Rate of Flow: Each unit of a private sewage disposal system shall be designed to treat the volume of sewage discharged into it. These volumes shall be determined by the McLean County Health Department for each individual type of use. A collection tile connecting two or more of these individual systems shall be of adequate size for the proposed volumes.

B. Materials: All pipe used for collection tiles shall be vitrified clay pipe ASTM designation C-700 (extra strength), ductile iron pipe Class 150 conforming to ANSI A21.51, or PVC SDR 35 or Schedule 40. Vitrified clay pipe joints shall conform to ASTM C-425. Ductile iron pipe joints shall be mechanical or rubber ring (slip seal or push-on) joints. PVC joints shall be of a like material properly cemented with an approved cement.

C. Pipe Size and Slope: All common collectors carrying domestic sewage by gravity flow shall be designed for the anticipated flow volume through the pipe and having a minimum diameter of four (4) inches (100mm). All services shall be a minimum of four (4) inches (100mm). The minimum allowable slope shall be 1 percent for pipes less than eight (8) inches (200mm) in diameter. For pipes larger than eight (8) inches (200mm) slopes less than 1 percent will be allowed.

D. Alignment: All common collectors shall be laid straight in both horizontal and vertical planes between manholes unless otherwise approved by the County Engineer.

E. Sewer Size Changes: When common collectors of different diameters join in a manhole, the invert elevations shall be adjusted to maintain a uniform energy gradient. Alignment of the 0.9 depth points shall be implemented to meet the requirement.

F. Cleanouts and Manholes:

1. An approved cleanout shall be provided at the beginning of each collection tile;
2. A manhole shall be provided at all changes in grade, size or alignment and

at all intersections and shall not be more than five hundred (500) feet (160m) apart.

G. Common Collector Service Laterals:

1. Location: All services shall terminate a minimum of three (3) feet (1m) inside any property or easement line;
2. Depth: All services shall terminated at a depth of no less than five (5) feet (1.6m) below the finished ground elevation.

3. Slope: All services shall be laid at a 1% slope or greater. The last length of pipe at the property line shall be laid at 1%. Change in slope on services may be made by breaking joints, provided the joint seal is air tight and the recommendations of the manufacturer are not exceeded. Fittings not greater than a 45 degree bend may be used where changes in grade dictate.
4. Service tees or wyes over twelve (12) feet (4m) in depth shall be encased in portland cement concrete as per the standard detail.

7.04 EASEMENTS

All common collectors shall be installed in easements on lots of record or on outlots. Such easements shall be of sufficient width and the tiles shall be installed at such locations as to permit open cut installation and to allow for maintenance and repair within the boundaries of the easement without relocation or unreasonable interference with other utilities. Easements shall meet the following minimum standards:

A. Be a minimum of fifteen (15) feet (4.5m) in width plus five (5) feet (1.5m) for each additional utility except for a water line which shall be ten (10) feet (3m);
B. Any collection tile exceeding twelve (12) feet (3.5m) in depth may require additional width.

7.05 SPECIFICATIONS AND SPECIAL PROVISIONS

All common collectors shall be installed in accordance with all applicable sections of the Standard Specifications for Water and Sewer Main Construction in Illinois, the current edition as then modified, supplemented and amended by this manual or the McLean County Health Department. These modifications, amendments and amplifications have been provided in this chapter.

Special Provisions

Granular Cradle: A granular cradle (bedding and haunching) shall be required for all collection tiles as shown in the standard details and in accordance with Section 20-2.203 of the Standard Specifications for Water and Sewer Main Construction in Illinois.

Trench Backfill: Material used for the backfill of all trenches under another sewer or water main, or under existing or proposed streets or existing sidewalks or drainageways shall comply with Section 208 of the Standard Specifications for Road and Bridge Construction.

Compaction of Trenches: All common collectors under streets, driveways or sidewalks shall be compacted by a mechanical compactor, jetting or as directed by the Engineer.

Water and Sewer Service Markings: The contractor shall place 2"x4" boards extending from the bottom of the water or collection tile service to a height of two (2) feet (.6m) above the ground at the location where each service terminates. These markers shall be installed at the time the services are constructed.

Chapter 8
Water Distribution and Supply

All water distribution and supply systems shall meet all requirements of the Illinois Department of Public Health the McLean County Health Department or any other regulatory agency having jurisdiction over this type of system.

Chapter 9
Reserved

Chapter 10
Design and Construction Standards for Bridges and Culverts

10.01 Introduction

Where streets or roadways in or adjacent to property in a subdivision crosses drainageways, streams or creeks, or where bridges or culverts are otherwise proposed within the confines of a subdivision, or on the roadway adjacent thereto, they shall be designed and constructed in accordance with this chapter.

10.02 Right-of-Way Dedication

Bridges and culverts shall be located in dedicated public right-of-way of sufficient width to permit the construction, operation, maintenance and replacement of the improvement within the confines of the easement or dedicated right-of-way without relocation or other unreasonable interference with other public utilities located therein.

10.03 Design Standards

A. Bridges and culverts shall be of a width comparable to the abutting street or roadway, but shall not have less than twenty-eight (28) feet of width between curbs.
B. Bridges and culverts shall be of sufficient size to permit the flow from a 25-year storm event on the upstream drainage area in a post-developed situation according to the most recent edition of the Comprehensive Plan, but in no case be less than eighteen (18) inches (450mm) in diameter.
C. Bridges shall meet or exceed all applicable County, Department of Transportation, Illinois Commerce Commission, or other local, state or federal regulatory authority or accepted industry standard, whichever impose the most demanding requirements with respect to the preservation and protection of the public health, safety and welfare.

10.04 Specifications & Special Provisions

All bridges and culverts shall be constructed in accordance with all applicable sections of the Illinois Department of Transportation's "Standard Specifications for Road and Bridge Construction", the most current edition as modified, supplemented and amended by this manual or the County Engineer.
All pipe culverts shall be precoated annual corrigated metal culverts.

Chapter 11
Design and Construction Standards for Railroad Crossings

11.01 Introduction

Where a street or roadway in or adjacent to property in a subdivision crosses a railroad line, or where a railroad line is otherwise proposed within the confines of a subdivision, or on the roadway adjacent thereto, it shall be designed and constructed in accordance with this chapter.

11.02 Right-of-Way Dedication

Railroad crossings shall be located in dedicated public right-of-way of sufficient width to permit the construction, operation, maintenance and replacement of the improvement within the confines of the easement or dedicated right-of-way without relocation or other unreasonable interference with other public utilities located therein.

11.03 Design Standards

A. Railroad crossings shall be a minimum of two (2) feet (600mm) wider than the roadway of any road passing over the tracks.

B. Railroad crossings shall meet or exceed all applicable County, Department of Transportation, Illinois Commerce Commission, or other local, state, or federal authority or industry standard, whichever imposes the most demanding requirements with respect to the preservation and protection of the public health, safety and welfare.

Chapter 12
Standards for Other Public Utilities

12.01 Introduction

12.01 INTRODUCTION

All public and quasi-public utilities, including but not limited to gas, electric, telephone and cable tv lines shall be located underground unless otherwise permitted.

12.02 EASEMENT AND RIGHT-OF-WAY DEDICATION

Except for individual building or property services, utility lines shall be located in utility easements. No utilities will be permitted within the road right-of-way. Such easements shall be of sufficient width and the utilities shall be installed at such locations therein as to permit open cut installation, maintenance and repair within the confines of the easement without relocation or other unreasonable interference with other public or quasi-public utilities located therein, provided that no permanent structures shall be placed over these easements. Fences and vegetative material may be placed on easements, but if it becomes necessary to repair or inspect the underlying utility, the fence or vegetative material may be removed, damaged or destroyed at the expense of the property owner. Under no circumstances will the County or any Township be responsible for the repair or replacement of anything placed upon an easement.

12.03 DESIGN STANDARDS

A. Front yard electric transformers shall not be located above ground in front yard easements.

B. Side yard electrical transformers may be located above ground when the transformer is located behind the building setback line.

C. Easements shall have a minimum width of ten (10) feet (3m) plus five (5) feet (1.5m) for each additional utility to be provided.

12.04 SPECIFICATIONS AND SPECIAL PROVISIONS

All utility installation shall conform with the applicable County, Illinois Commerce Commission regulatory authority or accepted industrial standards, whichever imposes the highest and most demanding requirements for the preservation and protection of the public health, safety and welfare. All gas, electric, phone and cable tv lines shall be located five (5) feet (1.5m) from any water or sewer main or service.

Chapter 13
Sediment and Erosion Control

13.01 Introduction

13.02 Applicability

13.03 Standards for Design and Maintenance of Control Measures for Soil Erosion, Sedimentation and Storm Water

13.01 INTRODUCTION

The intent of this section is to require erosion control and storm water practices that will reduce the amount of sediment and other pollutants leaving development sites, both during and after construction and to reduce the impact of sedimentation from these developments on the receiving water courses. It is also the intent of this section to promote design and construction practices that 1) minimize ground disturbances during development; 2) maintain natural drainage; and 3) provide storm water storage. Erosion, sedimentation and storm water control measures are needed for the following reasons:

A. High rates of soil loss may occur from areas undergoing development for nonagricultural use including, but not limited to, the construction if dwelling units, commercial buildings, industrial plants, and public works.

B. The washing, blowing and falling of eroded soil across and upon roadways endangers the health and safety of users of these roadways by decreasing vision and reducing traction of vehicles.
C. Soil erosion necessitates the costly repair of gullies, wash-outs, embankments, drainage structures and stream banks.
D. Sediment from soil erosion can clog or reduce the flow and storage capacity of sewers, ponds, ditches and streams.
E. Sediment and associated pollutants can cause irreparable biological damage to the aquatic life in our streams, ponds, lakes and rivers and the species that are dependent upon that aquatic life.
F. Sediment limits the use of water and waterways for beneficial uses, including water supply, navigation, recreation, fishery resources, drainage and flood control.
G. Development, if not controlled, causes increases in peak storm water runoff rates which can lead to increased stream bed and stream bank erosion and flooding in receiving streams.
H. Erosion and stream bank instability caused by altered stream flow rates due to development can create unsafe conditions, adverse environmental impacts, and other conditions that require costly repairs or preventative measures to protect private and public structures and facilities.

13.02 APPLICABILITY

A. No land surface shall be disturbed unless an erosion control plan has first been submitted an approved for that activity, except as follows:

1. Land disturbing activities for which the area disturbed is less than 5,000 square feet;
2. For the conduct of agriculture involving normal agricultural practices;

3. Construction of one single-family dwelling, which is not part of a residential subdivision.

B. The County Engineer may require any non-agricultural construction activity, regardless of land disturbance area or type of activity, to comply with this ordinance if it is determined the construction activity may cause a sedimentation problem.

13.03 STANDARDS FOR DESIGN AND MAINTENANCE OF EROSION, SEDIMENTATION AND STORM WATER CONTROL MEASURES

A. All temporary sediment control measures shall be designed to control sediment for a five-year frequency storm event.
B. Design standards for erosion and sediment control measures shall comply with provisions of the Illinois Procedures and Standards for Urban Soil Erosion and

Sediment Control, published by the Urban Committee of the Association if Illinois Soil and Water Conservation Districts, latest edition, unless otherwise stated by this manual.

C. A written erosion control plan shall be provided along with the subdividers NPDES permit from IEPA.

A. The subdivider shall provide the name and telephone number of the person responsible for the installation, inspection and maintenance of the erosion control measures.

B. The responsible person shall keep a diary detailing the installation and maintenance of all erosion control measures.

C. After each storm event of ½” (12mm) or more the responsible person shall inspect all erosion control measures and have any needed repair or maintenance done in a timely manner.

13.04 EROSION, SEDIMENT, AND TEMPORARY STORM WATER CONTROL MEASURES

On-site sediment control measures shall be constructed and functional prior to initiating clearing, grading, stripping, excavation or fill activities on the site.

Sediment control measures and temporary storm water control measures are to be maintained so they are operating effectively until permanent ground cover and permanent storm water control measures are established.

The County Engineer may require additional control measures as necessary after a site inspection if sedimentation controls are not functioning properly.

The County Engineer may with written notice suspend operations if erosion control measures have not been installed or are not being maintained properly.

13.05 TEMPORARY GROUND COVER

All disturbed areas including lots on which no further construction is anticipated for twenty-one (21) days, shall have a temporary ground surface cover applied within seven (7) days of the last activity.

13.06 PERMANENT GROUND COVER

A. When the finish grading on any portion of a project has been completed, a temporary or permanent ground cover shall be applied within fourteen (14) days, or as soon thereafter as soil conditions allow.
If a temporary surface is applied, the permanent ground cover shall be applied as soon as conditions allow.

B. Rights-of-ways shall be seeded as follows:

1. All work shall be done in accordance with Section 250 of the Standard Specifications for Road and Bridge Construction;
2. Fertilizer nutrients with a ratio if 1:1:1 shall be applied at the rate of 270 pounds (300kg) per acre (hectare);
3. Seeding mixture Class 2, Roadside Mixture, shall be applied at the rate specified;
4. After the area has been seeded, mulch shall be applied in accordance with Section 251 of the Standard Specifications for Road and Bridge Construction.

C. Lots shall be seeded with an acceptable seed mixture or other type of permanent ground cover that will allow minimal soil erosion.

D. Public improvements will not be accepted until all public rights-of-way have permanent ground cover and all other areas of the subdivision have at least temporary ground cover.

Chapter 14
Reserved

Appendix VII- Public Comments