

City of New Berlin

Stormwater Management Master Plan

June 2000

Report

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Executive Summary

City of New Berlin Storm Water Management Plan

Introduction

Storm water management is a critical municipal responsibility. The effectiveness and efficiency of storm water management have a direct impact on public health and safety, storm water system planning, surface water quality, environmental habitat, and future development. The City of New Berlin and the Wisconsin Department of Natural Resources (WDNR) have joined in a cooperative effort to prepare a Storm Water Management Master Plan for the City of New Berlin. This report presents a summary of the storm water management plan prepared for the City of New Berlin. The development and preparation of the plan have been funded by a local assistance grant received by the City of New Berlin from the WDNR. The Storm Water Management Plan is intended to assist in the implementation of the *Nonpoint Source Control Plan for the Root River, Menomonee River, Upper Fox River, and Muskego-Wind Lakes Priority Watershed Projects*. The City of New Berlin was recently designated for municipal storm water discharge permitting under NR216 of the Wisconsin Administrative Code by the WDNR.

The purpose of the Plan is to identify an approach for the City of New Berlin to:

- control storm water drainage and flooding in the primary drainage system within the study area,
- improve the water quality of storm water runoff from urban non-point sources, and
- meet the municipal permitting application and compliance requirements.

The primary tasks conducted as part of preparing the storm water management master plan include:

- Establishing project objectives to guide the development of the Storm Water Management Plan.
- Establishing a storm water advisory group
- Providing guidance regarding the WDNR municipal storm water permit regulations.
- Inventorying existing conditions related to the drainage system and land use.
- Conducting the hydrologic-hydraulic analysis.
- Conducting a citywide culvert capacity analysis.

- Conducting the water quality analysis.
- Developing storm water management options to mitigate major flooding problems, provide sufficient storm water flow capacity, and reduce pollutant loadings.
- Reviewing plans prepared by others for specific areas within the city of New Berlin.
- Evaluating potential regional storage areas.
- Developing a recommended storm water management plan which addresses flood control, water quality improvement, development guidelines, operation and maintenance practices, development of a storm water management ordinance, and plan implementation.

Objectives and Criteria

Objectives and criteria guide the development of the Storm Water Management Master Plan. The objectives and criteria developed for the City of New Berlin Storm Water Management Master Plan are compatible with the Nonpoint Source Control Plans prepared for the Root River, Menomonee River, Upper Fox River, and Muskego-Wind Lakes Priority Watersheds and address local issues and concerns. The objectives are listed in Table ES-1.

Table ES-1: City of New Berlin Storm Water Management Master Plan Objectives

Objective #1	Provide water quality suitable to support the designated potential recreational and biological uses of the streams.
Objective #2	Provide storm water drainage and flood control facilities to prevent flood damages to property, prevent health and safety hazards, and prevent drainage-related nuisance and inconvenience.
Objective #3	Develop a storm water management system that effectively serves both existing and anticipated future land uses at the lowest practicable cost.
Objective #4	Reduce erosion and sedimentation from construction of new development and agricultural activities.
Objective #5	Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits.

Project Setting

The project area incorporates approximately 37 square miles of land including the entire City of New Berlin in Waukesha County, Wisconsin. The study area is generally bordered by College Avenue to the south, by Springdale Road to the west, by Greenfield Avenue to the north, and by 124th Street to the east as shown on Figure 1-1.

Land use within the study area effects both the quantity and quality of storm water runoff. Imperviousness, materials exposed to storm water, and traffic patterns are a few examples of land use characteristics which affect the hydraulics and potential pollutant loading from an area. The city is developed in urban and rural land uses. The future land use, based on the City of New Berlin Zoning Map, indicates that about 59 percent of the current agricultural lands will be developed into urban land uses. A breakdown of the existing and future land uses is shown on Figures ES-1 and ES-2.

Figure ES-1: Existing Land Use within the New Berlin Study Area

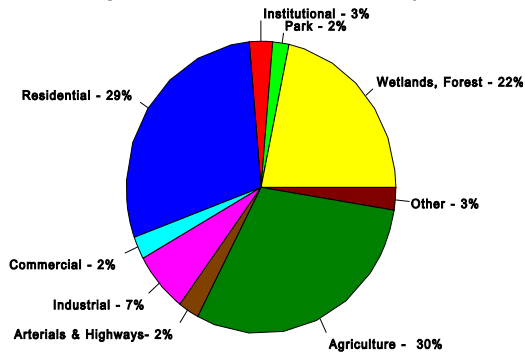
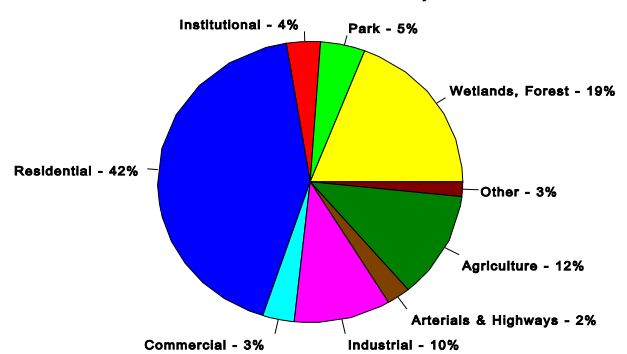


Figure ES-2: Future Land Use within the New Berlin Study Area



Storm Water Management System

Storm water runoff from the area is conveyed by a network of drainage ditches, storm sewers, culverts, and streams. A majority of the study area is drained by drainage ditch and culvert systems.

Culverts

Culverts are a major conveyance element in the City of New Berlin storm water management system. Information regarding about 1,400 culverts was obtained during a citywide field inventory. The inventory included documentation of:

- the shape, dimensions, length, and construction material of the culvert,
- the upstream and downstream invert elevations,
- the presence of debris or obstructions,
- the culvert end condition, and
- the structural condition of each culvert.

Information collected in the field inventory was used to identify blocked culverts and also used in the citywide culvert capacity analysis. Culverts which are significantly

undersized or obstructed reduce the efficiency of the storm water drainage system and may cause flooding.

Streambanks

Streambank erosion is responsible for the delivery of hundreds of tons of sediment to receiving streams annually. In order to reduce the sediment loading, existing and potential streambank erosion areas must be identified and repaired. Approximately 34 miles of channel were evaluated using field techniques developed by the U.S. Department of Agriculture. Nine stability indicators of the upper and lower bank areas of the stream channel were evaluated and classified as excellent, good, fair, or poor. The inventory of the streambank conditions indicated that:

- # Of the streambanks inventoried, the overall reach condition of 19.8 miles, or 59 percent, is classified good; 13.4 miles, or 40 percent, is classified fair; and 0.2 miles, or 1 percent, is classified poor.
- # Bank rock content is classified poor for 88 percent of the stream. This indicates that 20 miles of streambank have less than 30 percent rock in the bank and is a reflection of the overall geology of the area.
- # Vegetative bank protection, debris jam potential, and landform slope are the most common indicators, other than bank rock content, to be rated fair or poor.
 - < 9.5 miles, or 29 percent, of the streambanks have less than 70 percent plant density.
 - < 8.7 miles, or 26 percent, of the streambanks have the quantity and size materials present for the potential to create a flow deflection or debris jam.
 - < 7.2 miles, or 22 percent, of the streambanks have a slope steeper than 40 percent.
- # Evidence of mass wasting (severe slope failure) was generally not observed in the streambanks inventoried.
- # The Upper Root River, Poplar Creek, Calhoun Creek, and Underwood Creek subwatersheds have the greatest percentage of streambanks showing significant signs of erosion, streambanks with an overall classification of fair or poor.
- # The Deer Creek, Tess Corners Creek, and Mill Creek subwatersheds have the greatest percentage of streambanks in good overall condition. Poplar Creek and Deer Creek subwatersheds have the most miles of streambank in good overall condition.

Drainage Ditches

Drainage ditches convey storm water runoff to the receiving streams throughout a majority of the City of New Berlin storm water management system. The drainage ditches were visually evaluated based on location, shape, lining, erosion,

sedimentation, vegetation, trash, and standing water. The evaluation identified 32 areas of drainage ditch experiencing erosion, sedimentation, standing water, or debris buildup. Erosion, sedimentation, standing water, and debris buildup within the drainage ditches may significantly reduce the efficiency of the storm water management system.

Storm Water Management System Analysis

A computer analysis of the Primary Storm Water Management System in the City of New Berlin was conducted. The objectives of this analysis were to:

- evaluate the capacity and performance of major drainage structures,
- determine the extent of floodplain areas,
- assess the magnitude of future increases in flows and flood elevations due to future development areas, and
- identify existing and possible future capacity problems.

The system analysis consisted of the following tasks:

- Definition of the Primary Storm Water Management System
- Assembly of watershed surface runoff data
- Preparation of hydrologic model information
- Assembly of conveyance system data
- Formulation of the hydraulic model

The hydraulic analysis models were run using the 2-, 10-, 25-, and 100-year recurrence interval storm event runoff flows as input. The models were run under both existing land use and future land use conditions. The results of the hydraulic analysis consist of the flow rate, velocity, and depth at each location considered in the hydraulic model. This information can be used to identify areas of high flood level, channel and culvert capacity shortfalls, and areas of high erosion potential. Road overtopping was detected at 31 locations in the model including 16 locations where overtopping occurs in the 10-year event or less.

Differences between existing and future land use flows are shown in Table ES-2 for selected locations in each subwatershed. Flow increases are greatest in the Calhoun Creek, Deer Creek, and Poplar Creek subwatersheds, while flow increases are the smallest in the Underwood Creek and Upper Root River subwatersheds. The flow increases are typically due to future development within the subwatershed.

Table ES-2: Existing and Future Land Use Flows at Selected Locations

Location	Existing Flow (cfs)	Future Flow (cfs)	Percent Change (%)
Upper Root River at 124th Street	650	700	8
Deer Creek at Rogers Drive	1,250	1,522	22
Deer Creek at Moorland Road	534	579	8
Deer Creek at National Avenue	489	547	12
Calhoun Creek at City Limit	620	635	11
Calhoun Creek at upstream of Racine Drive	290	310	17
Calhoun Creek at upstream of Calhoun Road	300	320	22
Underwood Creek at Meadow Lane	380	400	6
Poplar Creek at Cleveland Avenue	114	136	19

Water Quality Analysis

A water quality analysis was conducted to estimate the amount of pollutants that are discharged into the major streams within New Berlin via storm water runoff. The results of the water quality analysis can be used to target appropriate best management practices to effectively reduce the pollutant loadings in critical areas.

The water quality model, a unit-area loading model, is based in part on the Source Loading and Management Model (SLAMM) developed by the WDNR. The analysis is based on:

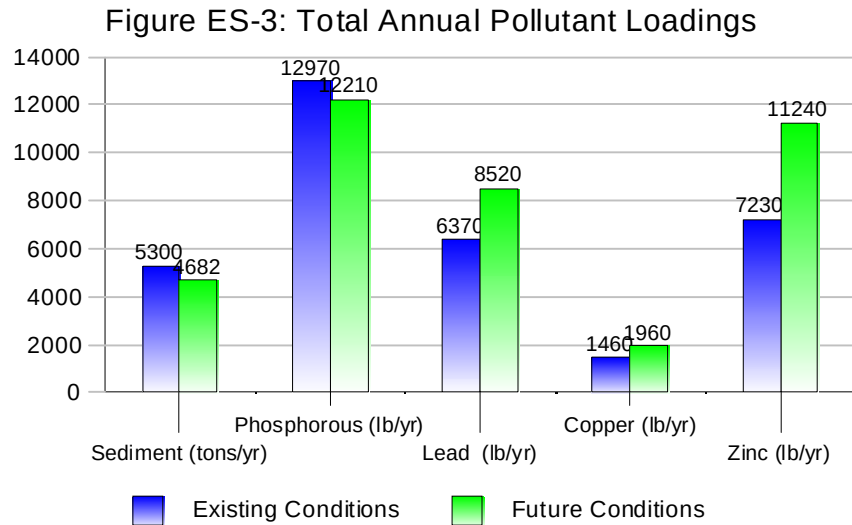
- the study area land use,
- pollutant loading rates for each land use category based on SLAMM, research results, and professional judgement, and
- existing practices, such as the use of drainage swales.

The analysis was conducted for sediment, phosphorous, copper, lead, and zinc, which are typically associated with urban storm water runoff and often cause water quality problems in urban streams. Urban stream water quality problems typically include decreased water clarity, sedimentation, excessive algal growth, and water toxicity.

The estimated annual pollutant loadings under existing and future land use conditions from the water quality analysis are shown on Figure ES-3.

The analysis indicated that:

- Agricultural and residential land use account for 49 and 44 percent of the total sediment loading under existing and future land use conditions, respectively.
- Extractive land use accounts for more than 20 percent of the total sediment loading under existing and future conditions.
- Agricultural and park land uses account for 57 and 46 percent of the phosphorous loading under existing and future conditions.



- Commercial, industrial, and highway land use account for 46 to 78 percent of the total metals loadings under existing and future conditions, respectively.
- The total sediment and phosphorous loading are reduced by 12 and 6 percent, respectively from existing to future conditions, while the metal loadings are increased by more than 30 percent due to development of agricultural lands.

A separate industrial pollutant loading analysis was conducted to further evaluate the amount of pollutants discharged to storm water runoff from industries within the City of New Berlin. The results can then be used to identify those industries that have the greatest potential for contributing significant storm water pollutant loadings and to identify appropriate best management practices for those industries. The analysis indicates that five of the industrial categories, fabricated metal products, transportation equipment, electronics, land transportation, and printing and publishing, contribute over one-half of the total industrial loading of all pollutants. The industrial facilities in these five categories occupy approximately 350 acres, or over 80 percent of the industrial areas evaluated. Based on the total loading calculated by the industrial water quality analysis:

- A majority of the industrial metals loading is contributed by fabricated metal products, transportation equipment, electronics, land transportation, and printing and publishing facilities.
- A majority of the industrial sediment loading is contributed by Timber Products and Land Transportation facilities.

- A majority of the industrial nutrient loading is contributed by transportation equipment and land transportation facilities.

Problem Areas

The analysis conducted as part of this storm water management master plan identified potential problem areas related to flooding and drainage, streambank stability, culvert capacity, and water quality. The problems identified are described in the following paragraphs.

Flooding and Drainage Problem Areas

Flooding and drainage areas were reported by City of New Berlin residents and representatives. In order to evaluate the flooding problems, a priority system was developed to differentiate varying degrees of problem severity. Priorities are based upon two factors: the cost-effectiveness of the project and whether storm water management improvements can adequately solve the problem. Primary problems encompass both factors. Seven primary problems were identified from the reported problems. The primary problems are presented in Table ES-3.

Table ES-3 Summary of Primary Flooding and Drainage Problem Areas

Problem Area Designation	General Location	Description of Problem
UNDERWOOD1	Underwood Creek at Meadow Lane	Along Meadow Lane between 128th and 124th Street, the South Branch of Underwood Creek is enclosed in a rectangular storm sewer. There are numerous reports of house, yard, and street flooding associated with this enclosed channel.
UNDERWOOD 2a	Underwood Creek near Elm Grove Road	This problem involves overbank flooding of yards and homes along a reach of the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. The primary cause of the problem is that the properties are in or very close to the 100-year floodplain.
UNDERWOOD 2b	Gatewood Park	This residential area, east of Sunny Slope Road and South of Greenfield Avenue, experiences extensive yard and basement flooding due to slow drainage of the neighborhood and adjacent cemetery. The cause of the problem is mild roadside ditch slopes and inadequate outlet capacity under Sunny Slope Road.
ROOT1	Upper Root River- 130th Block of Park Avenue	One residence experiences flooding along Park Avenue due to inadequately sized downstream culvert at Graham Street. Also, inadequate drainage ditch capacity exists between Elm Grove Road and Honey Lane south to the golf course.
ROOT2	Upper Root River – 132nd Street to Lagoon Road along Cleveland Avenue	Approximately 15 homes are within the floodplain in the area bounded by Cleveland Avenue, National Avenue, 124th Street, and 132nd Street. Road flooding occurs on Lagoon Road north of Cleveland Avenue. A private bridge at 128th Street and Cleveland Avenue has been washed out.
ROOT3	Upper Root River -	A structure located adjacent to a tributary of the Upper Root River near Grange Avenue

Table ES-3 Summary of Primary Flooding and Drainage Problem Areas

Problem Area Designation	General Location	Description of Problem
	LaSalle Drive and Grange Avenue	experiences flooding. The problem is caused by inadequate culvert capacity downstream at St. Mary's Drive.
ROOT4	Upper Root River - Honey Lane	Yard flooding and erosion are experienced by several residences along a tributary to the Upper Root River and also drainage problems along the railroad tracks north of Honey Lane near Elm Grove Road. The problem is due to inadequate drainage capacity and culvert capacity.
DEER1	Deer Creek - Buena Park	Six residences along 168th Street experience structural flooding. Several additional residences experience yard and basement flooding. The problem stems from backup from inadequate culverts, ditch capacity, and lot grading. The general area slope is very flat. In addition, most homes have sump pump discharge into the ditch. Lawn clippings and yard waste contribute to culvert blockage.

Thirteen storm water flooding problems were identified as minor. The New Berlin Storm Water Management Master Plan does not provide conceptual engineering solutions to minor system problems.

Culvert Capacity Problem Areas

The hydrologic and hydraulic computer modeling included a capacity analysis of 73 road crossings culverts in the primary storm water management system. The analysis indicates that 32 of the primary culverts have capacity deficiencies. Capacity deficiencies within the primary system are defined by the following criteria: overtopping of a main arterial in the 100-year storm, insufficient flow capacity for the 100-year storm, or excessive backwater behind a culvert in a developed area. Approximately 41 percent of the primary culverts with capacity deficiencies are located within the Upper Root River subwatershed.

Secondary culverts were analyzed as part of the citywide culvert capacity analysis. The analysis indicates that 83 culverts have culvert deficiencies. Capacity deficiency within the secondary system is defined as not being able to pass the 10-year storm.

Drainage Ditch Problem Areas

The drainage ditch inspection identified 32 problem areas. A problem area is defined as a location where erosion, sedimentation, debris accumulation, or standing water were observed. About 65 percent of the drainage ditch problem areas are located in the Deer Creek and Upper Root River subwatersheds.

Streambank Problem Areas

The streambank inventory classified approximately 14 miles of channel as fair or poor based on the US Department of Agriculture/Phankuch method. A majority of the

miles of streambanks rated as fair or poor are located in the Poplar Creek, Calhoun Creek, and Upper Root River subwatersheds.

Water Quality Problem Areas

Based on the annual pollutant loadings generated by the analysis, critical land uses, land uses which contribute a majority of the storm water pollutants, were identified. Critical land uses for sediment include agriculture, extractive, and residential land use; critical land uses for phosphorous include agriculture, residential, and park land uses, and critical land uses for metal include highway/arterial, commercial, and industrial land uses. Based on an overall consideration of the pollutant loadings, areas which are significant contributors of pollutants within New Berlin are identified and presented on Table ES-4.

Table ES-4: Significant Storm Water Pollutant Contributor Areas

Area	Contributing Land Use	Pollutants of Concern
Critical Land Use Areas throughout the City of New Berlin	Industrial, agricultural, residential, highways and arterials, and developing and redeveloping areas	Various
Rock Freeway	Highway	Metals
Industrial Park	Industrial and commercial areas	Metals
6C010 - Northwest area of Poplar Creek subwatershed	Industrial and agricultural areas	Metals, Phosphorous, Sediment
5A020 - Southeast area of Tess Corners Creek subwatershed	Agricultural and commercial areas	Sediment, Phosphorous, Metals
4C010 - Northern area of Calhoun Creek subwatershed	Residential, highway, and agricultural areas	Metals, Phosphorous Sediment
7D010 & Various - Northern area of Mill Creek subwatershed	Extractive	Sediment

The industrial analysis further evaluated the pollutant loadings from industries within New Berlin. Based on the analysis, the industries with the greatest potential for contributing significant storm water pollutant loadings are fabricated metal product manufacturers; transportation equipment manufacturers; land transportation facilities(warehouses and trucking facilities); electronic, electrical, photographic and optical facilities, and printing and publishing industries. Extractive industries are also considered a potential significant contributor based on the study area analysis.

Regional Detention Evaluation

The purpose of regional detention is to mitigate the cumulative impacts of existing and future development in an area. Regional detention is often proposed because it is perceived to be more effective at controlling flood peaks than constructing individual storage ponds at numerous sites. Presumably, a regional detention facility is also more cost effective than individual basins because of the economy of scale associated with building one large pond.

Sites evaluated for potential regional detention are located in the Poplar Creek and Tess Corners Creek Watersheds. The site locations and relative sizes are :

- Site RD-1 is located just north of College Avenue on the northeast side of Tess Corners Creek. This site will hold 240 acre-feet of water which will reduce the existing landuse 100-year peak flow by 100 cfs and reduce the future conditions peak flow by as much as 300 cfs. The detention facility would have a design depth of about 7 feet and cover an area of 38 to 40 acres.
- Site RD-2 is located just east of Calhoun Road, on the east side of Poplar Creek and south of Coffee Road. This site would be designed to hold 51 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 80 cfs. The detention facility would have a design depth of about 4.4 feet and cover an area of 20 acres.
- Site RD-3 is located on the west side of Poplar Creek, just south of Coffee Road. This site would be designed to hold 200 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 260 cfs. The detention facility would have a design depth of about 7.7 feet and cover an area of 45 acres.
- Site RD-4 is located on the east side of Calhoun Road, just north of Coffee Road. This site would be designed to hold 236 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 240 cfs. The detention facility would have a design depth of about 5.9 feet and cover an area of 67 acres.

The site locations are shown on the Recommended Plan Map presented in Appendix A of this report.

These regional sites will help prevent future flooding problems due to development and may reduce flooding problems that already exist.

Regional detention sites recommended in the Stormwater Management Plan for the Deer Creek Watershed prepared by Bonestroo Rosne Anderlick & Associates in 1993 and in the Westridge Storm Water Management Plan prepared by Ruekert /Mielke in 1995 have been incorporated into this report. The recommendations presented in the reports prepared by others were not analyzed as part of this Plan. The location of these storage locations recommended by others are presented in Appendix I.

Recommended Plan

The recommended plan includes a variety of structural and non-structural measures which will effectively and efficiently meet the goals and objectives of this plan, reduce flooding and drainage problems, and improve the quality of storm water runoff. The elements of the drainage and flood control plan, the water quality improvement plan, and the regional detention opportunities are presented on Tables ES-5, ES-6, and ES-7 respectively. The recommended plan also includes adoption and enforcement of a storm water management ordinance to prevent new flooding areas from occurring and reduce pollutant loadings from new development areas.

The estimated capital cost of the recommended plan is \$4,681,000. The estimated annual operation and maintenance cost is \$537,000. The estimated costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs.

The recommended plan provides a 100-year level of protection from flooding and drainage problems when feasible and results in a reduction in the total annual pollutant loading of 37 percent of sediment, 26 percent of phosphorous, and 7 percent of lead.

Table ES-5: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection	Capital Cost	Annual Operations and Maintenance Cost
UNDERWOOD 1	Along Meadow Lane between 128th and 124th Streets, the South Branch of Underwood Creek is enclosed in a storm sewer. Overflow of the box culvert entrance at 124th Street and Meadow Lane floods basements and backyards. There are numerous reports of house, yard, and street flooding associated with this enclosed channel.	Reduce flow with upstream storage recommended as part of UNDERWOOD 2a, increase conveyance capacity of the storm sewer entrance, including a sloped trash rack which is less susceptible to debris clogging.	100 year	\$50,000-\$100,000	\$8,000
UNDERWOOD 2a	Overbank flooding of yards and homes along the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. Flooding southwest of the intersection of Elm Grove Road and Meadow Lane.	30 acre-foot storage facility located north of Greenfield Avenue in the City of Brookfield. Also provides necessary storage for Problem UNDERWOOD 1.	100 year	\$790,000	\$10,000
UNDERWOOD 2b	Yard, street, and basement flooding in the Gatewood Park neighborhood.	Additional 60-inch storm sewer to serve Gatewood Park area.	25 year ¹	\$400,000	\$1,000
ROOT 1	One residence experiences flooding along Park Avenue near Elm Grove Road. Yard flooding and erosion in backyards on the north side of Park Avenue.	Installation of a new culvert at Graham Street and channel expansion between Graham Street and Elm Grove Road.	25 year ¹	\$101,000	\$1,000
ROOT 2	15 homes are within the floodplain in the area bounded by Cleveland Avenue, National Avenue, 124th Street, and 132nd Street. Road flooding on	Online detention storage at four locations in the area and floodplain lowering.	100 year	\$2,500,000	\$10,000

Table ES-5: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection	Capital Cost	Annual Operations and Maintenance Cost
	Lagoon Road north of Cleveland Avenue. Washout of private bridge at 128th Street and Cleveland Avenue				
ROOT 3	House flooding upstream of Grange Avenue near Francis Avenue.	Replace culverts at St. Mary=s Drive and lower floodplain south of Grange Avenue.	100 year	\$350,000	\$1,000
ROOT 4	Yard flooding and erosion near Honey Lane and Elm Grove Road. Flooding of one residence and several yards east of the intersection at Elm Grove Road and Honey Lane.	Regrade roadside and railroad ditches in the area.	10 year ¹	\$30,000	---
DEER 1	Six residences experience structural flooding along 168th Street in the Buena Park neighborhood south of Greenfield Avenue. The flooding is caused by inadequate drainage. Sump pumps discharge to the drainage ditch and lawn clippings and yard waste contribute to culvert blockage.	Reconstruct ditches with some segments of storm sewer from Fullerton Avenue to Roosevelt Avenue. Also redirect sump pumps to lawn areas rather than direct discharge to the drainage ditches. Clean debris from ditches and culverts.	10 year ¹	\$180,000	\$2,000
Various	Minor System Flooding Problems- Upper Root River subwatershed: < Parkwood Lane Storm Sewer Capacity Calhoun Creek subwatershed: < Sediment and debris blockage at Sovereign Dr. Poplar Creek subwatershed:	To be determined	to be determined	to be determined	to be determined

Table ES-5: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection	Capital Cost	Annual Operations and Maintenance Cost
	< Minor erosion on Poplar Creek between Calhoun Road and Victor Road < Drainage easement backup at 157th Street and Monterey Drive. < Insufficient ditch storage at 158th Street and Santa Rosa Boulevard < Sediment and debris blockage at Calhoun Road and Salentive Drive Underwood Creek subwatershed: < Insufficient drainage from Highland Memorial Park < Lack of storm water conveyance at Gatewood Drive and Clover Knoll Place < Inadequate culvert capacity at Kostner Lane and C & NW Railroad < Sediment and debris blockage of Sunny Slope Road culvert < Surcharging manhole at 13000 block of Greenfield Avenue. < Insufficient ditch storage at 124th Street and Prospect Drive. Deer Creek: Inadequate local drainage in backyards between 164th and 168th Street and Roosevelt Avenue.				

Table ES-5: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection	Capital Cost	Annual Operations and Maintenance Cost
Citywide	Undersized culverts	Replace designated culverts	---	---	\$50,000
Citywide	Drainage ditch problem locations	Repair ditch areas to improve the conveyance efficiency	---	---	\$25,000
<i>Drainage and Flood Control Total</i>				\$4,426,000 ²	\$108,000 ²

Notes: ¹ an alternative to achieve 100-year level of protection was not considered economically feasible.

² these costs do not include alternatives to address minor system flooding problems.

These estimated costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs.

Table ES-6: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments	Capital Cost	Annual Operations & Maintenance Costs
Source Control Measures					
Develop in Accordance	The change from existing to future land use, based on the zoning map.	sediment 12% phosphorous 6%	As new areas are developed, the land use will transform from agricultural to urban. Sediment	---	---

Table ES-6: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments	Capital Cost	Annual Operations & Maintenance Costs
with the Zoning Map		lead -34%	and phosphorous loading will be reduced. However, due to the more urban land use, the metals loading is expected to increase.		
Adopt & Enforce Storm Water Ordinance	The draft storm water ordinance requires new development to provide storm water quality improvement.	sediment 9% phosphorous 5% lead 14%	The storage and water quality requirements will be essential in eliminating new flooding or water quality problems caused by urban development.	---	\$10,000
Industrial Best Management Practices	Industries regulated by NR216 are required to implement best management practices. Additionally, industries which are potential significant pollutant contributors should implement applicable suggested best management practices.	sediment 4% phosphorous 0.3% lead 3%	To ensure we achieve the estimated pollutant reduction, routine monitoring/reporting may be necessary.	Cost incurred by industries	Cost incurred by industries
Roadway Pavement Sweeping	Arterials and Industrial Park Area: Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 0.5% lead 3%	--	---	\$125,000
Ice Management Practices	Implement improved salt distribution methods, train personnel involved with salt distribution	variable	Ice management should involve a policy decision on the part of the common council regarding the frequency, level, and extent of deicing.	Minimal	Minimal
Catch Basin	Clean catch basins twice per year / install catch	sediment	--	\$5,000 per	\$70/yr./catch

Table ES-6: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments	Capital Cost	Annual Operations & Maintenance Costs
Cleaning / Retrofit	basins in new development or redeveloping areas which will be serviced by storm sewer.	0.04 tons/acre drained lead 0.05 lbs./ acre drained		new catch basin installed	basin cleaned (assume 200 basins cleaned /yr. for cost estimate)
Landscape Practices	Implement environmentally friendly landscape practices in institutional yards, park areas, school yards, city building yards, and vegetated median strips.	sediment 0.4% phosphorous 2% lead 2%	Examples of environmentally friendly practices include increased turf height, reduced weed control, replacement of turf with low maintenance ground cover or perennials, and reduced fertilizer application.	Minimal	Minimal
Snow Storage Practices	Locate snow storage areas in a well-vegetated area at least 200 feet from a drainage way or storm sewer inlet.	variable	Implementation of this practice provides the snow melt an opportunity to filter through the vegetated area which will remove a portion of the pollutant loading.	Minimal	Minimal
Erosion Control Ordinance	Increase the construction site inspection program, and train inspectors on erosion control techniques.	variable	--	Minimal	Minimal
Agricultural Practices	Encourage use of Agricultural BMPs such as conservation tillage and adopt a shoreline management ordinance.	sediment 6.5% phosphorous 7% lead 0.1%	County may be primarily responsible for implementation of agricultural practices.	Cost incurred by farmers	Cost incurred by farmers

Table ES-6: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments	Capital Cost	Annual Operations & Maintenance Costs
Streambank Stabilization	Stabilize key streambanks as identified in Section 7 (about 1.2 miles per year)	variable	Streambank stabilization measures may include: vegetation, erosion protection, and debris removal in designated areas.	---	\$250,000
Public Education and Information Program	Provide information to the general public and industries on the Storm Water Management Master Plan	variable	Topics may include: Lawn care, pet waste handling, other best management practices, as well as the NR216 requirements. May utilize newsletters, newspaper articles, school programs, cable TV and use of preprinted materials and videos.	Variable	Variable
Treatment Measures					
Water Quality Detention Basin	Construct a water quality detention basin west of Kelly Lake.	sediment 2% phosphorous 1.5% lead 3%	--	to be determined	to be determined
Retrofit Wetland	Retrofit three prior converted wetlands into storm water treatment wetlands for highway runoff. Locations: north of I-43 west of Calhoun Road, north of I-43 west of Moorland Road, and south of I-43 east of Moorland Road.	sediment 2% phosphorous 3% lead 15%	--	\$75,000	\$10,000
Retrofit Wetland	Retrofit one prior converted wetland within Basin 5A020 south of National Avenue and east of	sediment 1% phosphorous 1%	Will collect runoff from agricultural and residential land use areas.	\$165,000	\$10,000

Table ES-6: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments	Capital Cost	Annual Operations & Maintenance Costs
	Moorland Road.	lead 0.5%			
Retrofit Wetland	Retrofit one prior converted wetland within Basin 3A060 north of College Avenue, west of Sunny Slope Road, and east of Small Road	sediment 0.2% phosphorous 0.1% lead 0.9%	Will collect runoff from commercial land use area.	\$15,000	\$10,000
<i>Water Quality Control Measures Total</i>				\$255,000*	\$429,000

* cost for installation of new catch basins not included.

Note: These estimated costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs.

Table ES-7: Potential Regional Detention Sites

Pond Number	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost
RD-1	Northeast side of Tess Corners Creek, North of College Avenue	1570	260	\$2,651,000 ¹
RD-2	East of Calhoun Road, south of Coffee Road	260	51	\$1,712,130 ¹
RD-3	West side of Poplar Creek, south of Coffee Road	2,150	200	\$8,430,030 ¹
RD-4	East of Calhoun Road, north of Coffee Road	370	236	\$13,504,870 ¹
Regional ponds recommended in the Stormwater Management Plan for the Deer Creek Subwatershed prepared by Bonestroo Rosene Anderlick & Associates ²				

Table ES-7: Potential Regional Detention Sites

Pond Number	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost
NP-1	NW & NE1/4 of Section 3	not available	1,64.3	\$971,000
CP-1	NW1/4 of Section 11	not available	0.3	not available
CP-2	NW1/4 of Section 11	not available	11.9	not available
CP-3	NE1/4 of Section 10	not available	24.1	not available
CP-4	SW1/4 of Section 3	not available	9.9	\$244,000
CP-5	SW1/4 of Section 3	not available	10.3	\$171,000
CP-6	SW1/4 of Section 3	not available	45.8	\$180,000
CP-7	SE1/4 of Section 3	not available	50.5	not available
CR-2		not available	not available	\$10,000
CR-3		not available	not available	\$26,000
SCP-1	SW1/4 of Section 11	not available	0.4	\$74,000
SCP-2	SW1/4 of Section 11	not available	2.2	\$24,000
SCP-3	SW1/4 of Section 11	not available	1.2	\$37,000
SCP-4	SW1/4 of Section 11	not available	5.3	\$144,000
SCP-5	SW1/4 of Section 11	not available	4.8	not available
SCP-6	SW1/4 of Section 11	not available	34.9	\$466,000

Table ES-7: Potential Regional Detention Sites

Pond Number	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost
SCP-7	SE1/4 of Section 10	not available	5.4	\$32,000
SCP-8	SE1/4 of Section 10	not available	8.8	\$50,000
CR-1	SE1/4 of Section 10	not available	25.1	\$10,000
SP-1	SW1/4 of Section 23	not available	11.2	\$4,000
SP-2	N1/2 of Section 23 & S1/2 of Section 14	not available	90.9	\$516,000
SP-3	SW1/4 of Section 14	not available	10.3	\$41,000
SP-4	SE1/4 of Section 14	not available	13	\$54,000
SP-5	SW1/4 of Section 14	not available	4.4	\$535,000
CR-4	Section 11,14,&23	not available	7.5	\$26,000
Regional ponds recommended in the Westridge Stormwater Management Plan prepared by Ruekert/Mielke ²				
G3	NE1/4 of Section 34	not available	18.5	not available
H1/2	SW1/4 of Section 23	58.5	3.61	not available
H1/4	NW1/4 of Section 26	68	6.92	not available
H1/5	NW1/4 of Section 26	90.4	3.34	not available
H1/6	NE1/4 of Section 27	27.9	3.54	not available
H2/1	SE1/4 of Section 27	87.6	5.01	not available

Table ES-7: Potential Regional Detention Sites

Pond Number	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost
H2/3	SW1/4 of Section 26	not available	3.00	not available
H3/2	NE1/4 of Section 27	not available	7.08	not available
H3/3	SW1/4 of Section 27	not available	13.32	not available
H3/4	NE1/4 of Section 27	not available	3.10	not available

Note:

1 - These costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs which may be associated with the plan.

2 - The recommendations presented in reports prepared by others were analyzed as part of this plan. The costs listed in this table have not been updated. The plans should be referred to for additional information.

Section 1

Introduction

1.1 Project Background

Storm water management is a critical municipal responsibility. The effectiveness and efficiency of storm water management have a direct impact on:

- Public health - polluted and contaminated waters can come into contact with citizens
- Public safety - streets and buildings can become damaged by flood water
- Storm water system planning, design, and construction
- Control and reduction of inflow and infiltration of storm water into the sanitary sewer
- Surface water quality
- Maintenance and enhancement of environmental habitats
- Future development
- Regulatory compliance

The City of New Berlin and the Wisconsin Department of Natural Resources (WDNR) have joined in a cooperative effort to prepare a Storm Water Management Master Plan for New Berlin.

The New Berlin study area incorporates about 37 square miles including the entire City of New Berlin. The study area is located within five major watersheds: the Upper Fox River watershed, the Middle Fox watershed, the Root River watershed, the Muskego-Wind Lakes watershed, and the Menomonee River watershed. These five watersheds are further divided into seven subwatersheds. Table 1-1 presents the drainage areas within each watershed and subwatershed. The study area and watershed boundaries are shown on Figure 1-1.

Each of these major watersheds, except the Middle Fox River, has been designated a Apriority watershed.@ Because these watersheds incorporate major portions of the region including several governmental entities, the New Berlin Storm Water Management Master Plan must be consistent with, and assist in the implementation of comprehensive flood control and non-point source plans.

Under the Wisconsin Non-point Source Water Pollution Abatement Program, the Wisconsin Department of Natural Resources developed non-point source control plans for several priority watersheds. Each non-point source control plan: assesses

the watershed characteristics including cultural natural resources, surface water, and groundwater features; describes watershed planning methods including evaluation of water quality and aquatic habitat; describes water resource conditions, non-point sources, and water resource objectives for the watershed; describes non-point control needs for urban and rural sources; and describes a detailed program for implementation. The WDNR prepared priority non-point source control plans for the Root River watershed (1980), the Menomonee River watershed (1991), the Upper Fox River watershed (1994), and the Muskego-Wind Lakes watershed (1994). The priority watersheds cover the entire city except for the 3.6 square mile area of the Mill Creek subwatershed within the Middle Fox River watershed. The Middle Fox River watershed is expected to be selected for priority watershed planning in 1999 or 2000.

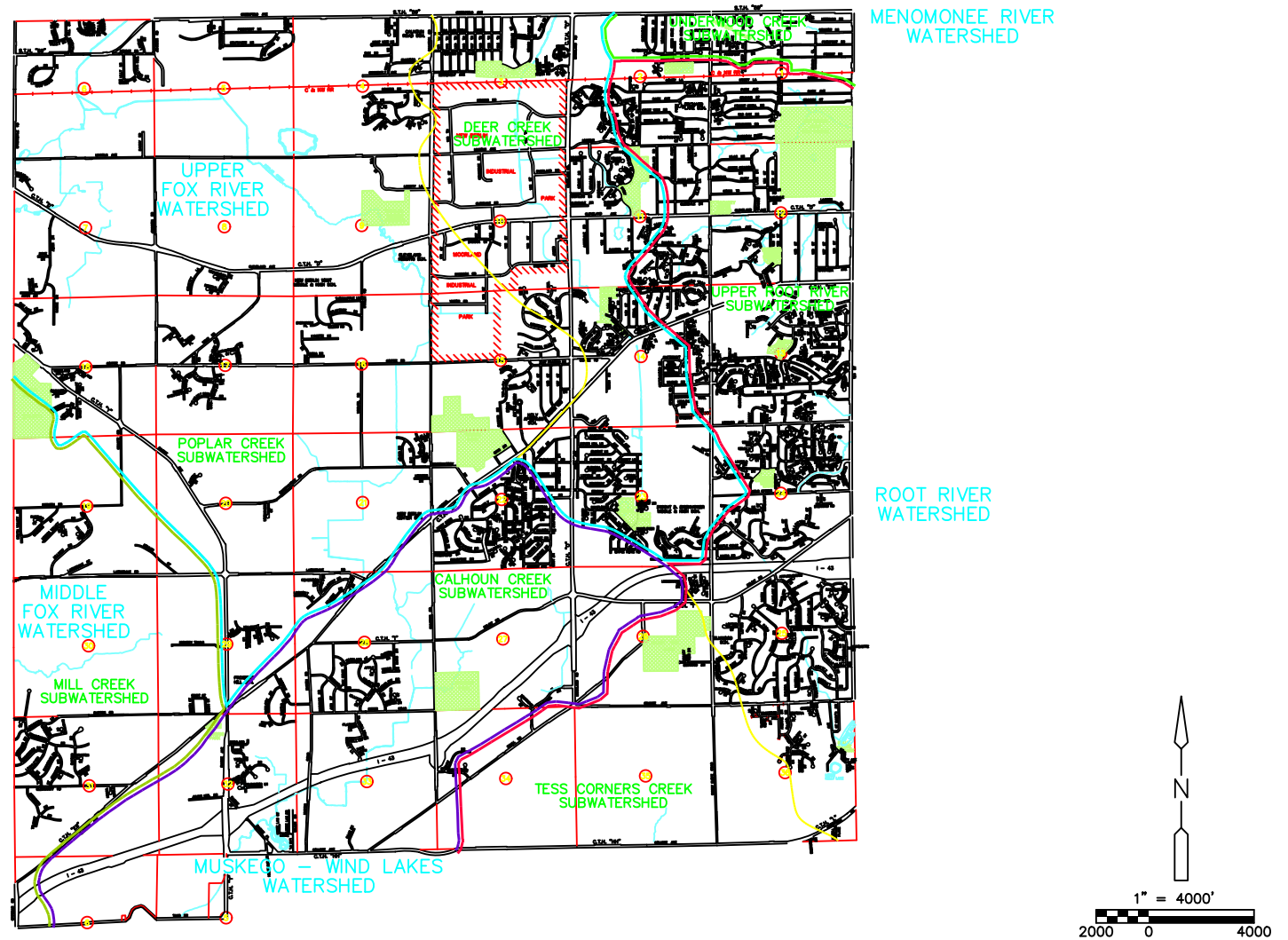


Figure No. 1-1
CITY OF NEW BERLIN
WATERSHED MAP

Table 1-1 Watershed Areas in the City of New Berlin

Watershed Subwatershed	Area (square miles)	Percent Total
Upper Fox River		
Deer Creek	4.7	13
Poplar Creek	12.5	34
subtotal	17.2	47
Muskego-Wind Lakes		
Calhoun Creek	6.2	17
subtotal	6.2	17
Middle Fox River		
Mill Creek	3.6	10
subtotal	3.6	10
Root River		
Upper Root	6.4	17
Tess Corners Creek	2.8	8
subtotal	9.2	25
Menomonee River		
Underwood Creek	0.6	2
subtotal	0.6	2
TOTAL	36.8	100

The Menomonee River, Upper Fox River, Root River, and Muskego - Wind Lakes watershed=s non-point source control plans include the following specific information:

- *Water Resource Objectives:* The overall water resource objective is to contribute to the full attainment of the designated potential recreational and biological uses of the

Menomonee, Upper Fox and Root Rivers, and the Muskego - Wind Lakes. The designated potential recreational and biological uses of each river/lake are as follows.

- Root River Watershed:
 - Upper Root River - limited fish and aquatic life
 - Tess Corners Creek - warm water fish and aquatic life
- Upper Fox River Watershed
 - Poplar Creek - warm water sport fish
 - Tributaries to Poplar Creek - warm water sport fish and forage fish, or limited aquatic life
- Menomonee River Watershed
 - South Branch Underwood Creek - limited to aquatic life
- Muskego - Wind Lakes Watershed
 - Calhoun Creek - warm water sport fish or warm water forage fish

Only the South Branch of Underwood Creek in the Menomonee River watershed is currently fully meeting its potential biological use. The remaining portion of the Menomonee River watershed and the other priority watersheds are currently partially meeting the potential biological use classifications. The WDNR recommends that biological uses be protected in those waters fully meeting their potential, enhanced in those waters partially meeting their potential, and improved in those waters not meeting their potential. In order to achieve the potential uses of the rivers, a 50 to 75 percent reduction in sediment loading, a 30 to 75 percent reduction in nutrient loading, and a 40 to 53 percent reduction in the loading of toxic substances, such as lead, was recommended for the Menomonee, Upper Fox and Root Rivers, and the Muskego - Wind Lakes.

- *Critical Urban Land Uses and Significant Rural Sources:* Critical urban land uses for the City of New Berlin identified within the priority watershed plans include:

Root River: Industrial, commercial, and planned development

Upper Fox River: Industrial, commercial shopping malls, and commercial strip areas

Menomonee River: Industrial, commercial, high density, residential, and planned development

Muskego-Wind Lakes: Industrial, high density, residential, freeway, and commercial

Significant rural non-point pollution sources identified include barnyard runoff, manure spreading, streambank erosion, and cropland erosion.

- *Recommended Pollution Control Measures:* ACore@ urban management measures recommended to achieve pollutant reductions included construction erosion controls, early spring street sweeping, leaf and lawn management, pet waste handling and disposal, used oil management, stream bank erosion control, and storm water management of new development. Each Priority Watershed Plan recommended a level of pollution control equivalent to providing wet detention (ponds) for 100 percent of the critical urban land uses. Recommended non-point source pollution control measures include grassed swales, infiltration basins and trenches, wet detention ponds, construction erosion controls, streambank stabilization, and agricultural land management practices and livestock controls.

To assist in implementation of the Non-point Source Plans the WDNR provides local assistance grants to communities. The City of Berlin received a local assistance grant from the WDNR to assist in funding the development of this storm water management plan. This planning effort is intended to assist in the implementation of the Non-point Source Control Plans for the Menomonee, Upper Fox, and Root Rivers, and the Muskego - Wind Lakes.

1.2 Purpose and Scope

The purpose of this Storm Water Management Master Plan for New Berlin is to:

- control storm water drainage and flooding in the primary system, such as in major storm sewers, natural streams and channels, and manmade channels,
- improve water quality from non-point sources, and
- assist New Berlin in their municipal permitting application and compliance efforts.

The development of the Storm Water Management Master Plan for the City of New Berlin includes the following tasks:

- Establishing objectives which are compatible with the WDNR priority watershed plans. Objectives are the goals that the plan will be designed to achieve. Project objectives are developed for water quality improvement, drainage and flood control, effective storm water management, erosion and sedimentation control, and environmentally sensitive area protection. The plan objectives and supporting criteria are presented in Section 2 of this report.
- Establishing a storm water advisory group including representatives from the City of New Berlin, WDNR, Wisconsin Department of Transportation (WDOT), and interested citizens. The primary role of the group is to guide the planning process by involvement in the plan and to support the plan recommendations.
- Providing guidance to New Berlin regarding the WDNR municipal storm water permit regulations including permit application options and requirements.

- Inventory of existing conditions related to the drainage system and land use including a review of available information from New Berlin, Waukesha County, Southeastern Wisconsin Regional Planning Commission (SEWRPC), WDOT, and WDNR, as well as field inventories of drainage culverts and storm sewers, stream channels, and wetlands. The project setting and storm water management system are described in Sections 3 and 4 of this report, respectively.
- Reviewing the storm water management plans prepared for the Deer Creek watershed and the Westridge area to identify recommendations to incorporate into the Storm Water Management Master Plan. Recommendations from the storm water management plans prepared by others are presented in Section 9 of this report.
- Conducting hydrologic-hydraulic analysis to develop peak flow conditions and to identify major storm water drainage and flooding problem areas. The hydrologic-hydraulic analysis methodology and results are presented in Section 5 of this report.
- Conducting water quality analysis to estimate the pollutant loadings to the major receiving streams within the project area. The water quality analysis methodology and results are presented in Section 6 of this report.
- Conducting an evaluation of regional storage sites to mitigate the cumulative impact of existing and future development in an area. The regional storage evaluation and results are presented in Section 8 of this report.
- Developing storm water management options to mitigate identified major flooding problems, provide sufficient capacity for storm water flows, reduce pollutant loadings to the receiving waters, and improve receiving water quality. The major flooding and water quality problem areas are identified in Section 7 and storm water management options are presented in Section 8 of this report.
- Develop a recommended storm water management master plan that consists of three elements: urban land development guidelines, flood control options, and water quality improvement recommendations. In addition, the three tasks listed below are included:
 - Develop an operation and maintenance program for the City's open channels, culverts, and detention facilities. The program will identify needed maintenance procedures and activities, establish a priority and schedule for maintaining individual system components and define program management needs.
 - Developing a prioritization system based on property damage, inconvenience, cost, and other factors, and outline procedures to address resident complaints and concerns about drainage or pollution problems.

- Developing a storm water management ordinance for the City of New Berlin. The ordinance will be based on the model ordinances prepared by the Waukesha County Department of Parks and Land Use and by the WDNR, but will be tailored to the City of New Berlin=s specific needs and conditions. The ordinance will be drafted in coordination with the City, WDNR, and the Advisory Group.

The recommended storm water management plan is presented in Section 9.

- Develop an implementation strategy for the recommended storm water management master plan. A schedule is developed to prioritize the recommended measures for implementation and funding. The implementation strategy is presented in Section 10.

Section 2

Objectives and Criteria

Objectives and criteria guide the development of the Storm Water Management Master Plan. The project objectives are the goals that this plan is designed to achieve. Each objective is supported by several criteria. Criteria are used to evaluate the degree to which each objective is achieved, to design plan components, and to measure the effectiveness of the plan.

Objectives and criteria established for this plan, presented on Table 2-1, are compatible with the Priority Watershed Plans and address local issues and concerns. The objectives and criteria address surface water quality, storm water drainage and flood control, protection of wetlands and other environmentally sensitive areas, and cost effectiveness.

Table 2-1: Objectives and Criteria for the New Berlin Storm Water Management Master Plan

Objective No. 1

Provide water quality suitable to support the designated potential recreational and biological uses of the streams. The designated use classifications are:

- # Root River Watershed
 - < Upper Root River -- limited fish and aquatic life
 - < Tess Corners Creek -- warm water fish and aquatic life
- # Upper Fox River Watershed
 - < Poplar Creek -- warm water sport fish
 - < Tributaries to Poplar Creek -- warm water sport fish, warm water forage fish, or limited aquatic life
- # Muskego - Wind Lakes Watershed
 - < Calhoun Creek -- warm water sport fish, warm water forage fish, or limited forage fish
- # Menomonee River Watershed
 - < South Branch Underwood Creek -- limited aquatic life

Criteria

- a. Achieve the water quality standard set forth in NR 102, 104, and 105 of the Wisconsin Administrative Code that support the designated use classifications.
- b. Achieve the pollutant reduction goals set forth in the non-point source control plans for the Root River watershed (1980), the Menomonee River watershed (1991), the Upper Fox River watershed (1994), and the Muskego - Wind Lakes watershed (1994). The pollutant reduction goals for sediment, phosphorous, and metals are:
 - # Sediment:
 - < Root River watershed -- 50% reduction in 1975 loadings
 - < Menomonee River watershed -- 50% reduction in 1985 loadings
 - < Upper Fox River watershed -- 60% reduction in 1985 loadings
 - < Muskego -Wind Lakes watershed -- 50% to 75% reduction in 1985 loadings

Objective No. 1 Criteria continued

Phosphorous:

- < Root River watershed -- 50% reduction in 1975 loadings
- < Menomonee River watershed -- 50% to 70% reduction in 1985 loadings
- < Upper Fox River watershed -- 35% reduction in 1985 loadings
- < Muskego -Wind Lakes watershed -- 30% to 50% reduction in 1985 loadings

Metals:

- < Root=s River watershed -- 50% reduction in 1975 loadings
- < Menomonee River watershed -- 53% reduction in 1985 loadings
- < Upper Fox River watershed -- 40% to 53% reduction in 1985 loadings
- < Muskego -Wind Lakes watershed -- no reduction required

- b. Achieve a level of pollution control equivalent to providing wet detention for 100 percent of existing critical land uses for established urban areas, and for 100 percent of planned urban growth.

Objective No. 2

Provide storm water drainage and flood control facilities to prevent flood damages to property, prevent health and safety hazards, and prevent drainage-related nuisance and inconvenience.

Criteria

- a. Design the minor storm water drainage system (storm sewers, roadside ditches) to accommodate runoff from a 10-year recurrence interval storm event.
- b. Design the major storm water drainage system (channels, bridges and major culverts) to accommodate runoff from a 100-year recurrence interval storm event.
- c. Prevent flood damages to buildings and significant road overtopping during a 100-year recurrence interval storm event.
- d. Establish emergency spillways for detention basins that would safely convey flow during a 100-year recurrence interval storm event.

Objective No. 3

Develop a storm water management system that effectively serves both existing and anticipated future land uses at the lowest practicable cost.

Criteria

- a. Modify existing drainage facilities and structures where necessary to accommodate the estimated design storm flows under both existing and future land use conditions.

- b. Design new storm water drainage systems to utilize, where possible, the natural drainage and storage system, to complement the proposed street layout and topography, and to accommodate anticipated peak flows and volumes under future land use conditions.

Objective No. 4

Reduce erosion and sedimentation from construction of new development and agricultural activities.

Criteria

1. Achieve a 75 percent reduction in uncontrolled construction site loadings of sediment by properly installing construction site erosion controls in accordance with the Wisconsin Construction Site Handbook, and by adequately maintaining those erosion controls to retain their effectiveness throughout the construction activity.
2. Within environmentally sensitive areas, achieve at least a 90 percent reduction in construction site sediment loading by utilizing procedures such as those described in the Special Erosion and Sediment Control issue of Watershed Protection Techniques (Vol.2, No. 3, February 1997)
3. Achieve at least a 50 percent decrease in 1985 agricultural loadings of sediment, as set forth in the priority watershed plans.

Objective No. 5

Protect environmentally sensitive areas that provide significant surface water quantity or quality benefits.

Criteria

- a. Identify wetlands and woodlands that provide storm water detention and infiltration, sediment retention, or nutrient removal.
- b. Protect, enhance, and/or preserve high quality environmentally sensitive areas that provide storm water benefits.
- c. Integrate valuable environmentally sensitive areas into the storm water management plan and into zoning.
- d. Prevent the discharge of increased storm water flows and pollutant loadings that would damage environmentally sensitive areas.

Section 3

Project Setting

3.1 Study Area

The study area incorporates 37 square miles within Waukesha County, Wisconsin including the entire City of New Berlin. The study area is located within five major watersheds: Upper Fox River watershed, the Middle Fox River watershed, the Root River watershed, the Muskego - Wind Lakes watershed, and the Menomonee River watershed.

The study area is generally bordered to the south by College Avenue, to the west by Springdale Road, to the north by Greenfield Avenue, and to the east by 124th Street. The study area is shown on Figure 1-1.

3.2 Land Use

Land use affects both the quantity and quality of storm water runoff.

Imperviousness, materials exposed to storm water, and traffic patterns are a few examples of land use characteristics which affect the hydraulics and potential pollutant loading from an area.

The study area is developed in urban and rural land uses. Existing land use conditions (1995) are based on the City of New Berlin Land Use Map. Future land use conditions within the City of New Berlin are based on the City of New Berlin Zoning Map, as directed by City staff.

A breakdown of the existing and anticipated future land use within the study area is presented in Figures 3-1 and 3-2. Agricultural land comprises about 30 percent, or 7,152 acres, of the study area under existing land use. The future land use

Figure 3-1: Existing Land Use within the New Berlin Study Area

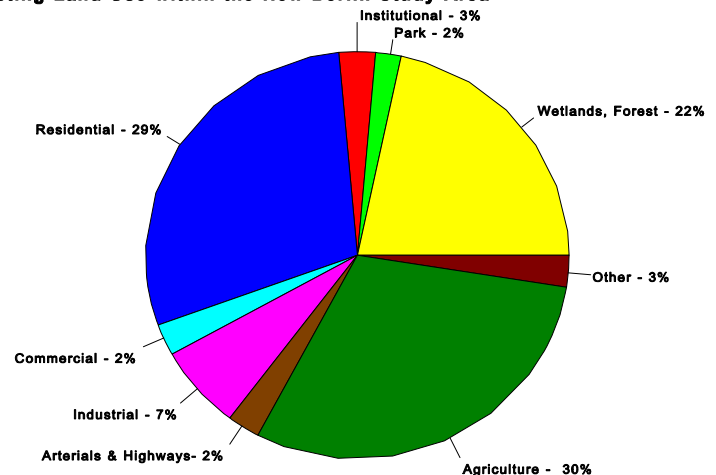
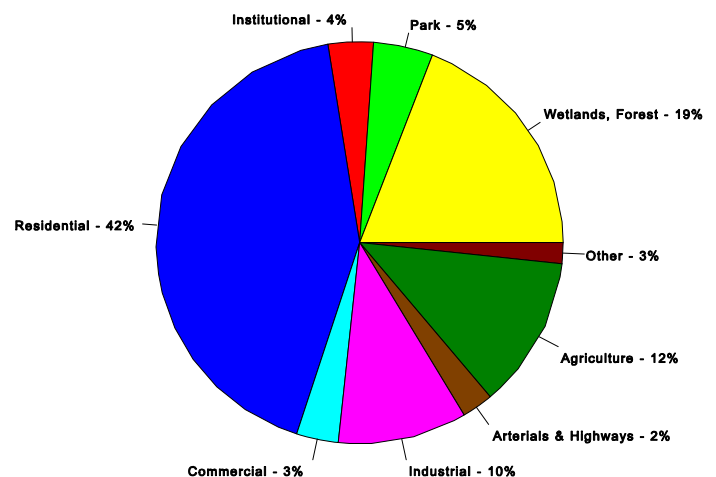


Figure 3-2: Future Land Use within the New Berlin Study Area



conditions indicate that about 4,200 acres, or 59 percent, of the current agricultural land will be developed into urban land uses. A majority of the future development within the study area is planned to be residential. Residential land use is divided into low, medium, and high density. The residential density level relationship to the City of New Berlin zoning rank is presented on Table 3-1.

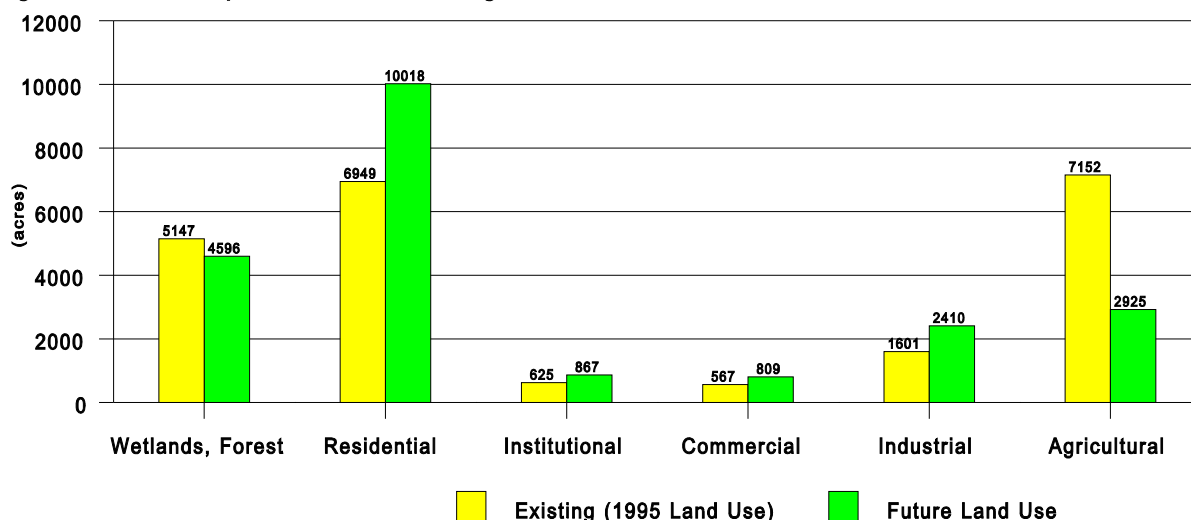
Table 3-1: Summary of Residential Density Level and City of New Berlin Zoning Rank System

Residential Land Use Description	City of New Berlin Zoning Rank	Average Number of Dwelling Units per Net Residential Acre ¹
Low Density	R1, R2, R3, R4	< 2.2
Medium Density	R4.5, R5, Rd1	2.3 to 6.9
High Density	Rm1	>7

¹ as defined Southeastern Wisconsin Regional Planning Commission

A majority of the current agricultural land is located in the north and west portions of the study area. Urban land uses, such as residential, commercial, industrial, and institutional are generally located within the areas bounded by Calhoun Road, Greenfield Road, 124th Street, and Grange Road. The future land use conditions indicate that a significant increase in residential, industrial, and other urban land use is anticipated. Figure 3-3 shows a comparison between the existing and future land use conditions within the study area. The hydrologic-hydraulic and water quality analysis were conducted under both the existing and anticipated future land use conditions.

Figure 3-3: Comparison of Existing and Future Land Use

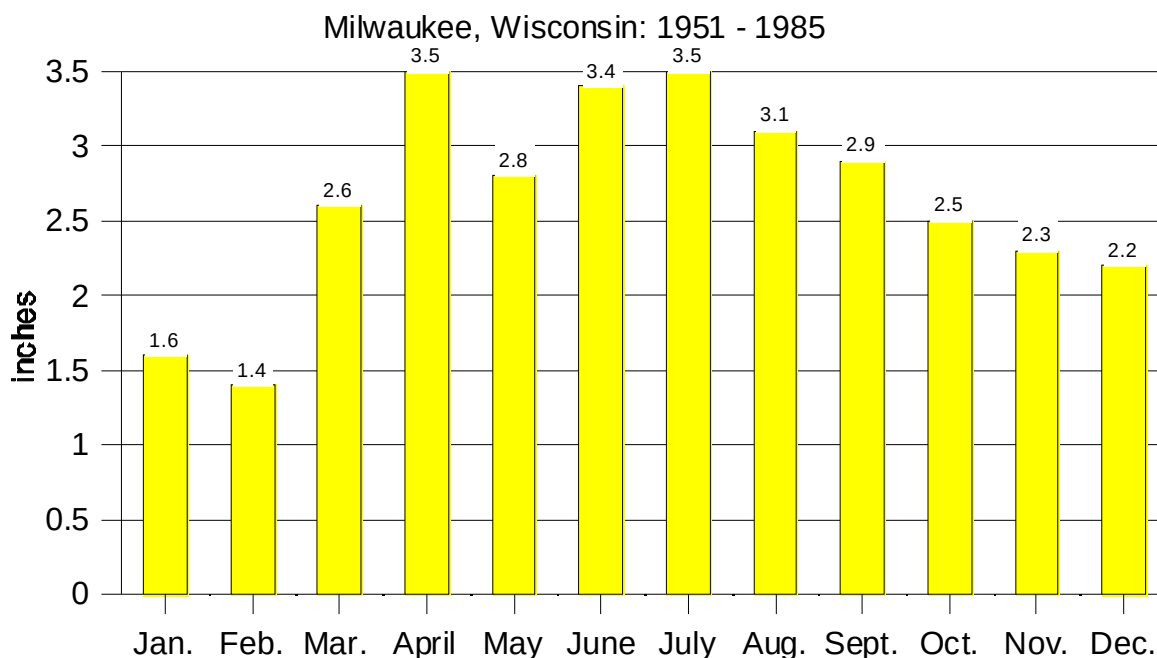


3.3 Climate

Climate affects the quantity and quality of storm water runoff from any given area. Variations in temperature, type of precipitation, and seasonal freezing and thawing all effect the runoff and drainage conditions. Flooding potential and pollutant delivery rates increase when spring thaws combine with rain events or major thaws occur when the ground is frozen. Freezing conditions may also affect the performance of certain types of storm water management best management practices (BMPs).

The Milwaukee area has a wide range of seasonal variation with average temperatures ranging from approximately 19 degrees Fahrenheit in January to 70 degrees Fahrenheit in July. The average annual precipitation (rain, snow, sleet, and/or hail) in the Milwaukee area is 31 inches. Average precipitation amounts vary from 1.4 inches in February to 3.5 inches in April and July. Approximately 50 storm events with at least 0.1 inches of precipitation occur each year. The average monthly temperature and precipitation amounts based on data collected by SEWRPC from 1951 through 1985 are presented in Figures 3-4 and 3-5, respectively.

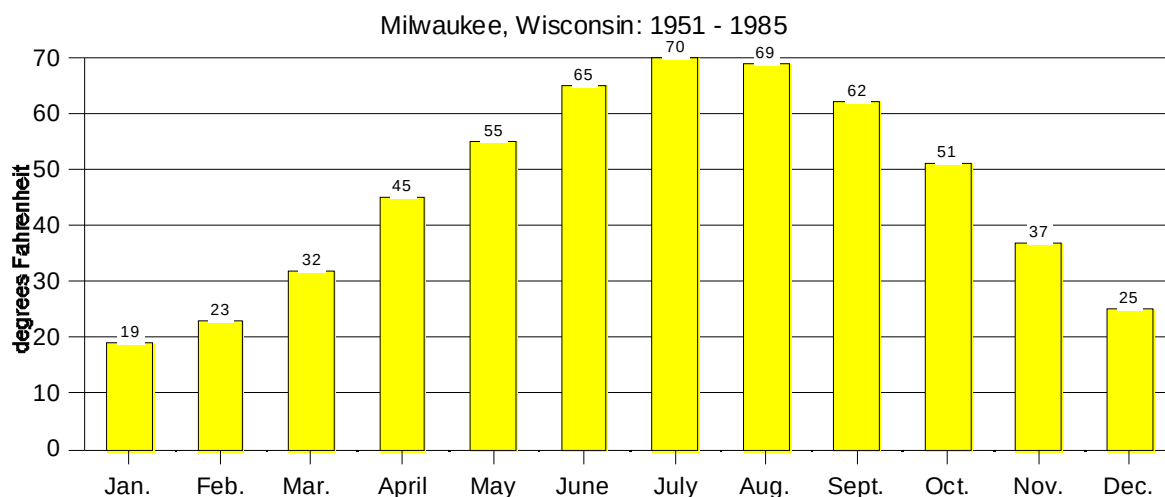
Figure 3-4: Average Monthly Precipitation



3.4 Topography

The ground surface within the study area has gently rolling topography which generally slopes downward toward the east. The ground surface elevations range from a maximum of 1070 feet above mean sea level, within the Mill Creek subwatershed, to a minimum of 746 feet above mean sea level, within the Upper Root River subwatershed. Approximately one-fourth of the study area lies east of the

Figure 3-5: Average Monthly Temperature



subcontinental divide and drains to Lake Michigan. The subwatersheds that drain to the east include Underwood Creek, Upper Root River, and Tess Corners Creek. The remaining three-fourths of the study area drains west to the Mississippi River. A summary of the topography within each major subwatershed is presented in Table 3-2.

Table 3-2: Summary of Subwatershed Topography

Subwatershed	Area (acres)	Maximum Elevation (feet above mean sea level)	Minimum Elevation (feet above mean sea level)	Maximum Change in Elevation (feet)
Underwood Creek	667	925.0	780.0	145.0
Upper Root River	4,107	957.0	746.0	211.0
Tess Corners Creek	1,701	957.1	810.0	147.1
Deer Creek	2,771	930.2	834.0	96.2
Calhoun Creek	4,821	1010.8	808.0	203.8
Poplar Creek	8,992	1044.2	822.0	222.2
Mill Creek	2,393	1070.0	861.5	208.5
		Maximum Elevation in Study Area = 1070 feet	Minimum Elevation in Study Area = 746 feet	Maximum Elevation Change in Study Area = 324 feet

3.5 Soils

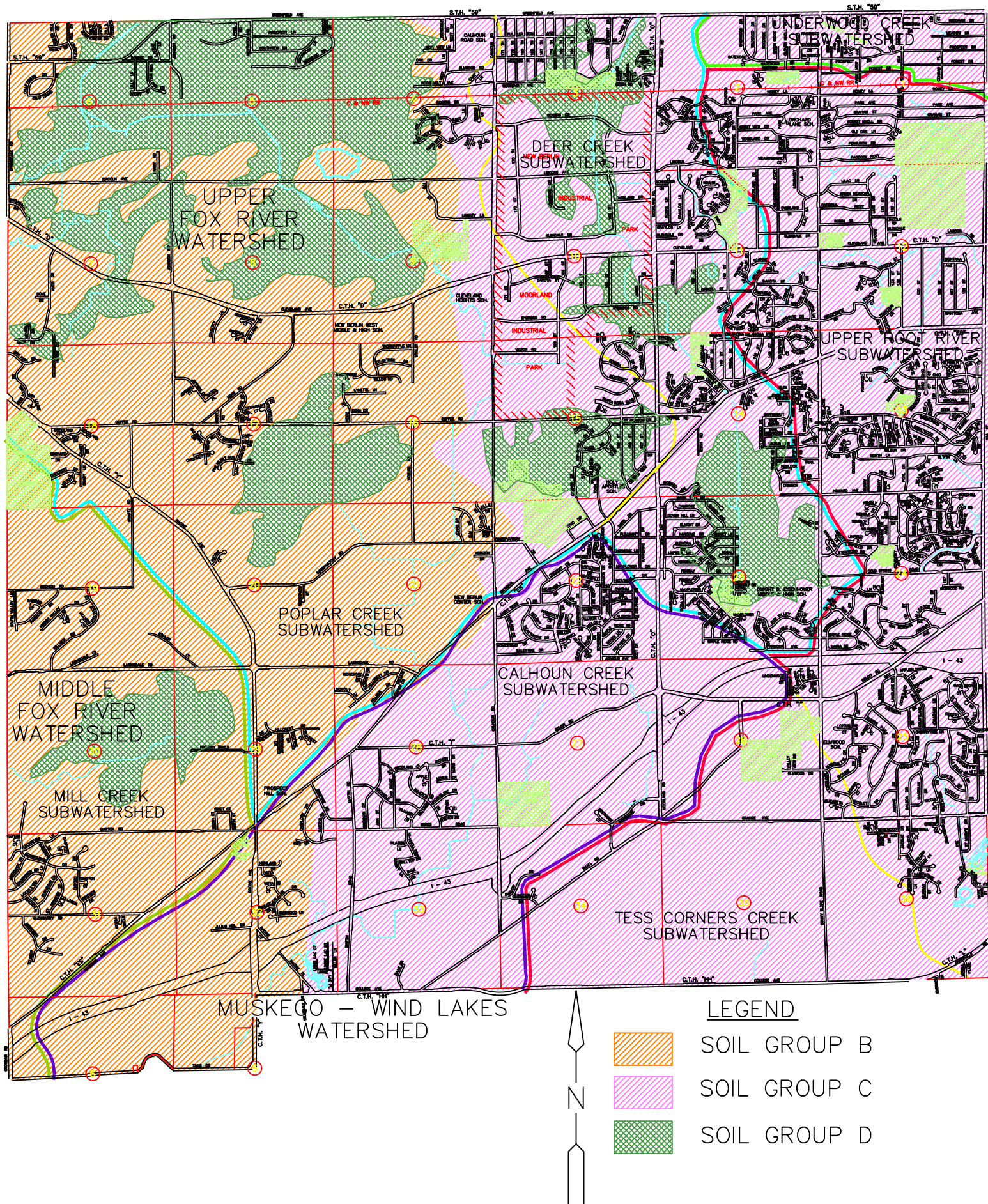
Soil type influences the storm water infiltration capacity and erosion potential. Infiltration capacity and erosion potential are based on the soil texture, structure, content, permeability, slope, and position on the landscape.

Soils are classified hydrologically by the U.S. Department of Agricultural (USDA) Soil Conservation Service (SCS) as A, B, C, or D. Group A soils are generally well drained and have a low runoff potential; Group B soils are generally moderately drained and have a moderate runoff potential; Group C soils are somewhat poorly drained and have a moderate to high runoff potential; and Group D soils are very poorly drained and have a high runoff potential.

According to the *Soil Survey of Milwaukee and Waukesha Counties, Wisconsin* (USDA, 1971) the soils in the project area are typically silt loam in either the Hochheim - Theresa or Ozaukee-Mequon associations. The characteristics of the soils are presented in Table 3-3. Approximately 25 percent of the soils within the study area are classified as SCS Soil Group B which indicates water infiltration into the soils is fair and water runoff is moderately low. These areas are located in the southwest quarter of the study area and are valuable for storm water infiltration techniques described in Section 8. The general soil texture across the city of New Berlin is shown on Figure 3-6.

Table 3-3: Soil Characteristics within the New Berlin Study Area

Soil Association	Texture	Drainage	Runoff Rate	Erodibility	SCS Hydrologic Soil Group	Percent of Study Area
Montgomery-Martinton-Hebron – Saylesville	Clay to Clay Loam	Poor to Well	High Runoff Potential	Moderate	D	10
Ozaukee-Morley-Mequon	Silt Clay Loam to Silty Clay	Poor to Well	Moderately High Runoff Potential	Slight	C	50
Houghton - Palms-Adrian	Organic	Very Poor	High Runoff Potential	Moderate	D	10
Hochheim-Theresa	Clay Loam to Silty Clay Loam	Well	Low Runoff Potential	Slight to High	B	25
Other	Includes mucky peat, silt loam,	Varies	Varies	Varies	-----	5



	and alluvial land					

3.6 Surface Water Resources

Predominant surface water resources within the study area include perennial streams, intermittent streams, and lakes. More than 30 miles of perennial stream channels are located within the study area. Numerous intermittent streams, which flow when runoff or groundwater discharge is high, discharge into the perennial streams. Named lakes include Upper Kelly Lake and Lower Kelly Lake located in the southeast portion of the study area. Linnie Lac is located the southwest portion of the study area. Numerous unnamed lakes exist throughout the study area and are typically water-filled quarries. Major streams located within the study area are identified in Table 3-4. Surface water resources are shown on Plate 1 in Appendix A.

3.7 Wetlands

Wetlands are an important feature of the study area due to their value in supporting wildlife habitats, ability to stabilize storm water runoff and flood flows, and their ability to remove sediment and nutrients from surface waters. Approximately 82 wetland areas, incorporating more than 2,800 acres, were identified within the City of New Berlin study area.

Table 3-4: Major Streams within the New Berlin Study Area

Stream Name	Approximate Stream Subwatershed Area within the Study Area (square miles)
<i>Upper Fox River Watershed</i>	
Deer Creek	4.7
Poplar Creek	12.5
<i>Middle Fox River Watershed</i>	
Mill Creek	3.6
<i>Root River Watershed</i>	
Upper Root River	6.4
Tess Corners Creek	2.8
<i>Muskego Wind – Lakes Watershed</i>	
Calhoun Creek	6.2
<i>Menomonee River Watershed</i>	
Underwood Creek	0.6

3.8 Natural Areas

Natural areas are defined by the Wisconsin Natural Areas Preservation Council as tracts of land or water so little modified by human activity, or sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape. One natural area has been designated within the study area. This natural area is summarized in Table 3-5.

Table 3-5: Designated and Known Natural Areas within the New Berlin Study Area

Area Name	Location	Ownership	Size (acres)	Description
New Berlin Woods	T6N, R20E Sections 11,14 City of New Berlin	Private	35	Small dry-mesic hardwoods with shallow depressions that retain water in spring. Dominant trees include white and red oaks and sugar maple. Rare species habitat, natural area with county or regional significance.

Source: *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin* (SEWRPC, 1997)

In addition to the natural area designated by Natural Areas Preservation Council, one nature preserve, Stigler Nature Preserve, is located within the study area.

3.9 Wisconsin Storm Water Regulations

Wisconsin Administrative Code NR 216, which contains the storm water regulations, was promulgated on November 1, 1994. These regulations establish criteria for permitting storm water discharges from certain municipalities, industries, and construction sites. Most industries which are covered by the permit are required to prepare a storm water pollution prevention plan, while construction sites which disturb more than five acres are required to prepare a construction site erosion control plan. Municipalities that are covered by the Permit may be required to prepare a storm water pollution prevention plan for certain industrial facilities. Subchapter 1 of NR 216 contains the specific storm water permit requirements for municipalities and requires that the following municipal dischargers of storm water obtain a storm water discharge permit:

- Municipal separate storm sewer systems serving incorporated areas with a population of 100,000 or more:
 - Cities of Madison and Milwaukee
- Municipalities in the Great Lakes Areas of Concern:

- Cities of Green Bay, Allouez, Ashwaubenon, DePere, Marinette, Sheboygan, and Superior
- Municipalities in priority watersheds with a population of 50,000 or more:
 - Cities of Eau Claire, Racine, West Allis, and Waukesha
- Discharges from a municipal separate storm sewer system which either contribute to a violation of a water quality standard or are a significant contributor of pollutants to waters of the state. Municipalities may either be identified by the WDNR or by a municipality previously listed.

The City of Milwaukee has been under a storm water discharge permit since October 1994. During the permitting process, 29 surrounding municipalities were identified as potential significant contributors of storm water pollution to Wisconsin waters.

The WDNR evaluated all of the designated municipalities using the criteria listed below to determine which municipalities will be required to obtain storm water discharge permits:

- Physical connection between the municipal separate storm sewer system and the City of Milwaukee system.
- Location of the separate storm sewer system discharge relative to the City of Milwaukee's discharge
- The quantity and nature of pollutants discharged to waters of the state
- The nature of the receiving waters
- Protection of the watershed or basin drainage area receiving the discharge
- Population of the municipality

On August 2, 1996 the WDNR notified 21 municipalities that they will be required to obtain a Municipal Storm Water Discharge Permit. The City of New Berlin was not among the municipalities notified to obtain a storm water discharge permit at that time. However, the City was recently notified by the WDNR that New Berlin will be required to obtain a municipal storm water discharge permit. The permit application requirements include the following items.

- A demonstration that the applicant has legal authority established by statute, ordinance, or series of contract to:

- < control the contribution of pollutants to the municipal separate storm sewer from industrial storm water discharges.
 - < prohibit illicit discharges to the storm sewer system.
 - < control the discharge of spills, dumping, or disposal of materials to the storm sewer system.
 - < control through inter-municipal agreements between co-applicants the contribution of pollutants from one municipal storm sewer system to another.
 - < require compliance with conditions in ordinances, permits, contracts, or orders.
 - < carry out all inspections, surveillance, and monitoring procedures necessary.
- A storm sewer system map including:
- < identification and outline of the storm water drainage basins, the watersheds, and the municipal separate storm sewer systems.
 - < boundary defining the final Urban Storm Water Planning Area and all municipal borders within the area.
 - < listing and location of all known municipal separate storm sewer outfalls discharging to waters of the state with pipe size and consideration of Amajor.@
 - < location and description of each currently operating or closed municipal landfill or other treatment, disposal, or storage facility for municipal waste
 - < the location of major structural controls for storm water discharges.
 - < identification of publicly owned parks, recreational areas, and other open lands.
- A description of existing management practices to control pollutants from municipal separate storm sewer systems including the following:
- < existing source area controls and structural Best Management Practices, including operation and maintenance measures.
 - < existing programs to identify illicit connections to the municipal separate storm sewer including inspection procedures, methods for detecting and preventing illicit discharges, areas where this program has been implemented, and summary of the results.
- An inventory, by watershed, of the industrial facilities which likely discharge storm water to the municipal separate storm sewer system including:
- < name and address of each facility
 - < Standard Industrial Classification (SIC) or other description of products or services provided by the industry.
- A characterization of the quality and quantity of storm water runoff and the effects on the receiving waters including:

- < monthly mean rainfall and snow fall estimates, or summary of weather bureau data, and monthly average number of storm events.
 - < location and description of land use activities, including estimated average runoff coefficient, population densities, and projected growth for a ten-year period within the drainage area.
 - < if available, quantitative data describing the volume and quality of discharges including a description of the outfalls, sampling procedures, and analytical methods.
 - < listing of water bodies that receive discharges from the municipal separate storm sewer system, locations in these water bodies where pollutants from storm water discharges may accumulate and cause water quality degradation, and known water quality impacts.
- A proposed schedule to provide pollutant loadings to receiving water bodies and the event mean concentrations.
 - A proposed monitoring program for data collection for the term of the permit.
 - A schedule to provide a proposed storm water management program that will be developed and initiated during the term of the permit.
 - A fiscal analysis of the estimated capital and operation and maintenance expenditure necessary to implement the proposed management programs, including a description for the source of funds, incorporating any restrictions on the use of the funds.

Permit application requirements will be partially completed as part of this Storm Water Management Plan. The WDNR will review the Permit application submitted by New Berlin, and issue a Storm Water Permit. The Permit conditions will likely include requirements for best management practices, pilot studies, ordinance, and monitoring.

3.10 Other Storm Water Management Related Regulations

In addition to the Wisconsin Storm Water Regulations, contained in NR 216 and described in the previous section, there are several federal, state, and local regulations which affect storm water management. A summary of the current regulations and requirements is provided in Table 3-6. It should be noted that regulatory requirements will likely change over time.

Table 3-6: Summary of Storm Water Management Related Regulations

Regulating Authority	Regulation	Description	Regulated Community/Activity
US EPA	Clean Water Act 40 CFR Part 122	40 CFR Part 122 directs regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. The WDNR has permitting authority for this regulation and administers the program through NR 216.	X Municipalities X Industries X Construction sites disturbing over 5 acres
US Army Corps of Engineers	Clean Water Act Section 404	Section 404 provides the federal government with the federal authority to administer activities which may impact navigable waters of the United States.	X Dredging within a navigable waterway or wetland X Placing fill within a navigable waterway or wetland X Other activities which may impact a navigable water of the United States
WDNR	NR 216 - Wisconsin Storm Water Regulations	NR 216 requires regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. Section 3.9 of this report describes NR 216 more completely.	X Municipalities X Industries X Construction sites over 5 acres
WDNR	NR 120 - Wisconsin Non-point Source Pollution Abatement Program	NR 120 establishes the administrative framework for the implementation of the State=s Non-point Source Pollution Program.	X Governmental units, state agencies, landowners and land operators that receive grants of cost sharing monies from the WDNR
WDNR	NR 116 - Wisconsin Floodplain Management Program	NR 116 requires municipalities to adopt reasonable and effective floodplain zoning ordinances.	X Regulates the type of land use, site design, and structural design of development in floodplains
WDNR	NR 117 - Wisconsin Shoreland - Wetland Protection Program	NR 117 establishes minimum standards for city and village shoreland-wetland zoning ordinances.	X Projects which effect wetlands five acres or larger within shoreland areas of cities and villages

Table 3-6: Summary of Storm Water Management Related Regulations

Regulating Authority	Regulation	Description	Regulated Community/Activity
WDNR	NR 103 - State Wetland Permit	NR 103 describes the review process used by WDNR to determine the impacts of projects which may affect delineated wetlands. The review criteria include dependency on the wetland, potential practical alternatives, impacts on the wetland water quality standard, cumulative wetland impacts, and secondary wetland impacts.	X Projects which effect delineated wetlands
WDNR	Chapter 30 - State Water Regulation Permit	Chapter 30 regulates activities which affect navigable waterways within Wisconsin.	X streambank stabilization X dredging of navigable waterway X filling of navigable waterway X channel improvements X other activities which affect a Wisconsin navigable waterway
City of New Berlin	Erosion Control Requirements	The erosion control ordinance regulates land disturbing and land developing activities within the City of New Berlin.	projects which: X disturb greater than 4,000 square feet X excavate or fill 400 cubic yards X disturb greater than 300 linear feet of trenching X involve any road or waterway
City of New Berlin	Zoning Ordinance	The Zoning Ordinance promotes the health, safety, morals, comfort, prosperity, and general welfare of the City of New Berlin.	X regulates and restricts the use of all structures, lands, and waters within the City of New Berlin

Section 4

Storm Water Management System

4.1 Introduction

The storm water management system within the New Berlin study area includes storm sewer, drainage ditches, culverts, streams, and wetlands. An inventory of the storm water management system was conducted as part of the preparation of this Storm Water Management Master Plan. The information gathered is used to provide input into the modeling analyses, help define the existing storm water related problems, and provide the database needed to develop storm water management measures.

4.2 Hydraulic Structure Inventory

An inventory to identify and document drainage and hydraulic control structures was conducted by Ruekert and Mielke, Inc. staff during the Summer of 1997. The primary purpose of the inventory was to collect data on the roadway culverts and storm sewers.

Nearly 1,400 culverts were observed and documented during the inventory. The inventory included culverts that crossed public roads. During the inventory, each culvert was assigned an identification number based on its location. The identification number includes the public land survey section, the quarter section, and a culvert number. For example culvert 36-01-03 is located in section 36, and is in the 01 quarter section and is culvert number 3. The inventory included:

- visual survey of all roadways within the study area to identify culvert crossing locations,
- field inspection and survey of each culvert or structure, and
- completion of a culvert inventory worksheet.

The field inspection documented:

- the shape, dimensions, length, and construction material of the culvert,
- the upstream and downstream inverts,
- the percent blocked,
- the culvert end condition, and
- the structural condition of each culvert.

A copy of a completed inventory worksheet is shown on Figure 4-1. The information collected during the field inspection, along with the nearest cross street, is

Figure 4-1: Culvert Inventory Field Form

INSPECTOR: ATS/SCWG
DATE: 10/30/97
PROJECT #: 14-92026

NEW BERLIN CULVERT INVENTORY FORM

SHEET 37 OF 54

DATE: 1/30/97		PROJECT #: 14-a2026																						
CUL	ID	PT#	Street	Length	Mat'l Type	Top of Road Elev.	End Condition			Pipe End w/o Grate		Ditch Depth (ft)		Distance To Pavement		Other	Apparent Flooding Problem Area							
							Size	Length	RCP, CMP, OTHER	Good	Fair	Poor	High	Low	High		Low	High	Low	Flood Debris/Dep.	Resident Report	Pond'g/St'd'g Water	Other	% Blockage
CUL	10-04-13	PT#	3433	Street	160 st.	24x36					≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	10-04-14		3434	Street	160 st.	24x36					≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	10-04-15		3435	Street	Esplanade						≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-02-01		3436	Street	166 st	46x66	53				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		1.0				25		
CUL	15-02-02		3437	Street	166 st	46x66	53				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		2.0				50		
CUL	15-02-03		3438	Street	166 st	46x66	53				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		1.0				25		
CUL	15-02-04		3437	Street	Victor	21x30	54				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		.75		.2		25		
CUL	15-02-05		3438	Street	Victor	21x30	58				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		.75		.2		25		
CUL	15-02-06		3439	Street	Victor	36x58	49				≥ 60"	(36"-60")	>5	(3-5)	(2)	<2		1.0		.2		33		
CUL	15-02-07		3444	Street	Victor	36x58	49				≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-02-08		3447	Street	Calhoun	60	66	CMP		✓	≥ 60"	36"-60"	>5	(3-5)	(2)	<2	.4 Lower w/E			1.5		0		
CUL	15-02-09		3448	Street	Calhoun	60	66	CMP		✓	≥ 60"	36"-60"	>5	(3-5)	(2)	<2	.4 Lower w/E			1.5		0		
CUL	15-02-10		3449	Street	Calhoun	60	66	CMP		✓	≥ 60"	36"-60"	>5	(3-5)	(2)	<2	.4 Lower w/E			1.5		0		
CUL	15-02-11		3451	Street	Calhoun	60"	63'	CONC			≥ 60"	36"-60"	>5	(3-5)	(2)	<2		.2				5		
CUL	15-02-12		3478	Street	Calhoun	60					≥ 60"	36"-60"	>5	(3-5)	(2)	<2		.1				5		
CUL	15-02-13		3479	Street	Calhoun	60					≥ 60"	36"-60"	>5	(3-5)	(2)	<2		.5				10		
CUL	15-02-14		3452	Street	Coffee	24"	38'	CMP			≥ 60"	36"-60"	>5	(3-5)	(2)	<2		1.0				65		
CUL	15-02-15		3453	Street	Coffee	21x27"	38'	CMP			≥ 60"	36"-60"	>5	(3-5)	(2)	<2		1.0				65		
CUL	15-02-16		3457	Street	Coffee	36"	204	CMP			≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-02-17		3458	Street	Coffee	36"	43				≥ 60"	36"-60"	>5	(3-5)	(2)	<2	Same length as 02. INV 84.80					0		
CUL	15-01-01		3462	Street	Coffee	30x18	37.5	CMP			≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-01-02		3463	Street	Coffee	24"	43	CMP			≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-02-18		3473	Street	Victor	36x58	49				≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-02-19		3474	Street	Victor	24"	59				≥ 60"	36"-60"	>5	(3-5)	(2)	<2						0		
CUL	15-01-03		3485	Street	Monteary Dr	18x30					≥ 60"	36"-60"	>5	(3-5)	(2)	<2		.25						

summarized on a database which is presented in Appendix C and was provided to the City of New Berlin.

Of the 1,400 culverts observed, 65 culverts were identified as being more than 50 percent blocked. The culverts with the most significant maintenance problems which require near term maintenance have been identified in a separate memorandum submitted to the City for prompt corrective action.

4.3 Water Resources System

The water resource system within the study area includes waterways, storm sewers, and drainage ditches. Approximately 20 percent of the study area is serviced by storm sewer and the remainder of the study area is serviced by drainage ditches and culverts.

A majority of the City of New Berlin is serviced by drainage ditches and culverts. The condition and size of the drainage ditches are widely varied. Field inspection indicated that some sections of the drainage ditch system have been filled or are otherwise blocked.

Storm sewer system service areas throughout the City of New Berlin. The storm sewered areas are generally located east of Moorland Road and north of Beloit Road.

Each subwatershed was divided into subbasins in order to evaluate the hydraulics and water quality impacts. In general, the subbasins are delineated so that each subbasin contains an area which drains to a specific inflow point or connecting point on the main storm water drainage system. The subbasins vary in size from approximately 10 acres to more than 900 acres. The majority of the subbasins are less than 300 acres. The subbasins are delineated based on a review of existing topographic maps, existing storm sewer maps, and, if necessary, field inspection.

Major features of the New Berlin drainage system are presented on a water resources map shown on Plate 1 in Appendix A. Major features shown on the map include:

- <Watershed boundaries
- <Subwatershed boundaries
- <Subbasin areas
- <Primary drainage system
- <Culverts and storm sewers
- <Road planimetry
- <Stream rating
- <Water quantity problem areas
- <Water quality problem areas

4.4 Streambank Inventory

Streambank erosion is responsible for the delivery of hundreds of tons of sediments to receiving streams annually. In order to reduce the sediment loading existing and

potential streambank erosion areas must be identified and repaired. A detailed field inventory of the stream channels within the study area was conducted to evaluate the channel stability and to prioritize streambank reaches which require stabilization measures. Approximately 34 miles of channel were evaluated using field techniques developed by the U.S. Department of Agriculture. The channels included in the inventory are shown on Plate 1 in Appendix A. The inventory technique used, known as the Pfankuch Method, evaluates nine stability indicators of the upper and lower bank areas of the stream channel. Each indicator is classified as excellent, good, fair, or poor. The Pfankuch Method assigns a numeric value to each classification which, when totaled for all of the indicators, results in an overall stream reach classification. A description of the indicators and classifications is presented in Table 4-1.

The streambank inventory included:

- Identification of streams within the study area based on base maps provided by the City of New Berlin.
- Field inspection of identified streams including completion of a field form evaluating each stream reach.
- Evaluation of overall streambank conditions.

Figures 4-3, 4-4, and 4-5 show examples of stream reaches inventoried and the classification rating.

The inventory of the streambank conditions indicated that:

- Of the streambanks inventoried, the overall reach condition of 19.8 miles, or 59 percent, is classified good; 13.4 miles, or 40 percent, is classified fair, and 0.2 miles, or 1 percent, is classified poor.
- Bank rock content is classified poor for 88 percent of the stream. This indicates that 20 miles of streambank have less than 30 percent rocks in the bank and is a reflection of the overall geology of the area.
- Vegetative bank protection, debris jam potential, and landform slope are the most common indicators, other than bank rock content, to be rated fair or poor.
- 9.5 miles, or 29 percent, of the streambanks have less than 70 percent plant density.
- 8.7 miles, or 26 percent, of the streambanks have the quantity and size materials present for the potential to create a flow deflection or debris jam.
- 7.2 miles, or 22 percent, of the streambanks have a slope greater steeper than 40 percent.

- Evidence of mass wasting was generally not observed in the streambank inventoried.
- The Upper Root River, Poplar Creek, Calhoun Creek, and Underwood Creek subwatersheds have the greatest percentage of streambanks showing significant signs of erosion, streambanks with an overall classification of fair or poor.
- The Deer Creek, Tess Corners Creek, and Mill Creek subwatersheds have the greatest percentage of streambanks in good overall condition. Poplar Creek and Deer Creek subwatersheds have the most miles of streambank in good overall condition.

A summary of the streambank classifications is presented in Table 4-2 and shown on Figure 4-6. Inventory results for each reach of stream inventoried are presented in Appendix B. The overall stream classification rating based on the inventory is also shown on Plate 1 in Appendix A.

Based on overall condition of the streambanks, the stream reaches with the most significant stability concerns are summarized in Section 7. The reaches identified with significant stability concerns should be repaired. Alternatively, streambanks which received the highest ratings, should be protected. The streambank reaches rated most stable are summarized in Appendix B.

Table 4-1: Summary of Stream Inventory Indicators and Classification

Location	Indicator Item Rated	Classification			
		Excellent	Good	Fair	Poor
Upper Bank - area between normal high water line and extreme high water line	Landform Slope - <i>steepness of land adjacent to the channel, related to extent and ease of erosion</i>	Slope <30%	Slope 30 - 40 %	Slope 40-60%	Slope >60%
	Mass Wasting or Failure - <i>detachment of soil and movement downslope, potential for large volumes of material to be introduced into the stream</i>	No evidence of occurrence	Infrequent or very small occurrences	Moderate frequency and size occurrences	Frequent or large occurrences
	Debris Jam Potential - <i>floatable objects such as branches or logs located along the bank, potential for the development of flow deflection and creation of debris jams</i>	Essentially absent	Mostly small twigs and limbs	Present - quantity and size of material increasing	Moderate to heavy amounts - mostly large size materials
	Vegetative Bank Protection - <i>density of vegetation on the bank, related to stability of bank soils and reduction in erosion potential</i>	Over 90% plant density	70-90% plant density	50-70% plant density	<50% Plant density
Lower Bank - area between the waters edge during low flow period to the normal high water line	Channel Capacity - <i>ability of channel to transmit the volume of water</i>	Ample for present flow and increases	Adequate - Overbank flow rare	Barely contains present peak flow	Inadequate - overbank flow common
	Bank Rock Content - <i>amount and size of rocks in the bank materials, related to the resistance to flow forces which may cause erosion</i>	65% rock - large boulders >12" diameter	40-65% rock - mostly small boulders and cobbles 6-12" diameter	20-40% rock - 3-6" diameter	<20% rock - 1-3" diameter
	Obstructions - <i>objects within the stream channel, obstructions may change in flow direction and velocity</i>	Rocks/old logs embedded - flow pattern without cutting or deposition	Some present - causing erosive cross currents and minor pool filling	Moderately frequent - causing bank cutting and filling of pools	Frequent obstructions - causing yearlong bank erosion and channel migration
	Cutting - <i>loss of vegetation protection on bank or increase in bank steepness</i>	Little or none evident: raw banks infrequent and less than 6" high	Some present: raw banks up to 12" high	Significant: raw banks 12-24" high	Almost continuous cuts: some over 24" high
	Deposition - <i>deposition of sediment resulting in growth of sediment bars, indication of upstream erosion</i>	Little or no evidence	Some new increases	Moderate deposition	Extensive deposition

Source: *Stream Reach Inventory and Channel Stability Evaluation* (U.S. Department of Agriculture Forest Service 1975)

Figure 4-3: Examples of stream reaches rated good.



Figure 4-4: Examples of stream reaches rated fair.



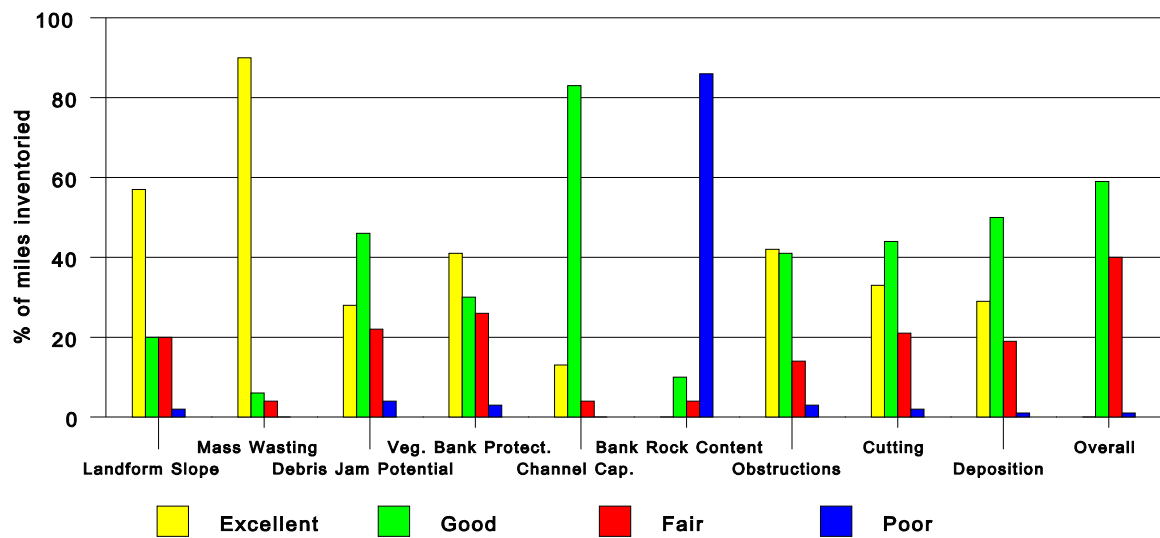
Figure 4-5: Examples of stream reaches rated poor.



Table 4-2: Summary of Streambank Condition

SUBWATERSHED	UPPER BANK														LOWER BANK																									
	Landform Slope				Mass Wasting or Failure				Debris Jam Potential				Vegetative Bank Protection				Channel Capacity				Bank Rock Content				Obstructions				Cutting				Deposition				Overall Reach Conditions			
	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor				
Deer Creek																																								
# of Reaches	20	5	7	1	25	6	2	0	22	7	3	1	16	17	0	0	14	17	2	0	0	13	4	16	18	10	3	2	18	9	6	0	16	8	9	0	0	25	8	0
Miles of Stream	3.9	0.6	1	0.1	4.6	0.8	0.2	0	3.3	1.8	0.4	0.1	2.7	2.9	0	0	2.1	3	0.5	0	0	1.8	0.7	3.1	2.9	2	0.4	0.3	3.1	1.8	0.7	0	2.6	1.6	1.4	0	0	4.6	1	0
Upper Root River																																								
# of Reaches	16	9	14	5	25	9	9	1	7	28	9	0	8	17	16	3	4	37	3	0	1	11	2	30	15	22	7	0	8	22	12	2	18	17	9	0	0	21	21	2
Miles of Stream	2.6	1.1	1.8	0.5	3.7	1.1	1.1	0.1	1.1	4	0.9	0	1.2	2.6	1.9	0.3	0.5	5.2	0.3	0	0.1	1.4	0.2	4.3	2	2.8	1.2	0	1	3.1	1.7	0.2	2.4	2.7	0.9	0	0	3	2.8	0.2
Tess Corners Creek																																								
# of Reaches	2	4	1	0	7	0	0	0	3	3	0	1	3	2	1	1	0	6	1	0	0	1	2	4	5	1	0	1	4	0	3	0	1	2	2	2	0	5	2	0
Miles of Stream	0.6	0.5	0.2	0	1.3	0	0	0	0.8	0.4	0	0.1	0.7	0.4	0.1	0.1	0	1	0.3	0	0	0.1	0.3	0.9	1.1	0.1	0	0.1	1	0	0.3	0	0.3	0.2	0.3	0.5	0	1.1	0.2	0
Underwood Creek																																								
# of Reaches	1	1	1	0	3	0	0	0	0	0	3	0	0	0	3	0	0	3	0	0	0	0	0	3	0	3	0	0	0	1	1	1	0	2	1	0	0	0	3	0
Miles of Stream	0.3	0.2	0.5	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0.2	0.3	0.5	0	0.2	0.8	0	0	0	1	0
Calhoun Creek																																								
# of Reaches	11	6	5	0	23	0	0	0	3	12	8	0	5	10	8	0	0	22	1	0	0	0	0	23	8	11	4	0	4	17	2	0	5	16	2	0	0	9	14	0
Miles of Stream	3.1	1.4	1.5	0	6	0	0	0	1.4	2.8	1.8	0	1.2	2.5	2.3	0	0	5.8	0.2	0	0	0	0	6	1.8	3.2	1	0	1.2	4.3	0.5	0	1.3	4.4	0.3	0	0	2.5	3.5	0
Poplar Creek																																								
# of Reaches	32	9	6	0	46	1	0	0	10	23	11	3	29	6	10	2	3	43	1	0	0	0	1	46	24	17	5	1	17	19	11	0	12	27	8	0	0	30	17	0
Miles of Stream	7.5	3	1.8	0	12.1	0.2	0	0	2.9	5	3.2	1.2	7.2	1.2	3.4	0.5	1.6	10.5	0.2	0	0	0	0.1	12.2	5.6	4	2.1	0.6	4.7	4.1	3.5	0	3.2	6.3	2.8	0	0	7.4	4.9	0
Mill Creek																																								
# of Reaches	2	0	0	0	2	0	0	0	0	2	0	0	1	1	0	0	0	2	0	0	0	0	0	2	1	1	0	0	0	2	0	0	0	2	0	0	0	2	0	0
Miles of Stream	1.2	0	0	0	1.2	0	0	0	0	1.2	0	0	0.7	0.5	0	0	0	1.2	0	0	0	0	0	1.2	0.7	0.5	0	0	0	1.2	0	0	0	1.2	0	0	0	1.2	0	0
Total																																								
# of Reaches	84	34	34	6	131	16	11	1	45	75	34	5	62	53	38	6	21	130	8	0	1	25	9	124	71	65	19	4	51	70	35	3	52	74	31	2	0	92	65	2
Miles of Stream	19.2	6.8	6.8	0.6	29.9	2.1	1.3	0.1	9.5	15.2	7.3	1.4	13.7	10.1	8.7	0.9	4.2	27.7	1.5	0	0.1	3.3	1.3	28.7	14.1	13.6	4.7	1	11	14.7	7	0.7	9.8	16.6	6.5	0.5	0	19.8	13.4	0.2
% Based on Miles	57	20	20	2	90	6	4	0	28	46	22	4	41	30	26	3	13	83	4	0	0	10	4	86	42	41	14	3	33	44	21	2	29	50	19	1	0	59	40	1

Figure 4-6: Summary of the Streambank Indicator Classification



4.5 Wetlands Inventory

The value of wetlands include their capacity to drain surges of storm water runoff and their ability to remove sediment and nutrients from surface water. The large storage capacity and controlled outfall of many wetlands detain storm water and release it slowly in more evenly distributed flow after a storm event. The long detention time, complex flow patterns, and nutrient uptake by wetland plants combine to make many wetlands very effective for removal and storage of sediment and for the removal and transformation of some dissolved nutrients from surface waters. The physical attributes of wetlands which provide storage capacity and flow control, such as very slow flow and a large storage capacity, also are favorable for water quality improvements.

An inventory of wetlands greater than two acres located within the study area was conducted. The wetlands inventory evaluated existing wetlands, as well as, wetlands which have been previously disturbed and prior converted wetlands. The purpose of the wetland inventory is to evaluate the existing wetland conditions based on:

- effectiveness - the existing wetland capacity to contribute to storm water management, and
- opportunity - the potential of the wetland to provide additional storm water management benefits with modification or restoration.

Wetlands which are currently effective have high functional value and typically possess little opportunity for improvement, while wetlands which are not currently effective have high opportunity for improvement.

The wetland inventory conducted for the study area included:

- Location and mapping of wetlands in the study area over two acres based on the following information:
 - <topographic maps (1 inch = 200 feet scale)
 - <1995 SEWRPC aerial photographs
 - <WDNR, 1986, Final Wetland Inventory maps for New Berlin
 - <NRCS Draft Wetland Inventory Maps showing an estimated boundary of wetland, farmed wetland, and prior-converted wetland areas.
- Field inspection of mapped existing and previously altered/prior converted wetland areas
- Evaluation of the effectiveness of the wetland areas to provide flood flow detention, sediment retention, and nutrient removal and transformation based on:
 - <wetland acreage,
 - <slope,
 - <wetland soil elevation relative to the mean water surface elevation,
 - <presence of inlets and outlets,
 - <outlet water level control and flow characteristics, and
 - <flooding extent and duration.
- Evaluation of the opportunity of each wetland area to perform flow and water quality improvement functions based on:
 - <sediment and nutrient sources within the drainage basin of the wetland,
 - <surface water drainage area of the wetland,
 - <size of the wetland relative to its watershed,
 - <relationship to other wetlands within the subbasin, and
 - <local slope and topography related to delivery of surface water runoff to the wetland.

The inventory identified 82 wetland areas within the study area incorporating 2,800 acres, or 12 percent of the total study area. The inventoried wetlands are shown on Figure 4-7. Over half (57%) of the total wetland areas are designated as prior converted. The prior converted wetland areas incorporate 1,570 acres. All of the wetland areas identified have been disturbed by development activities. Wetland areas within each subwatershed are summarized on Table 4-3.

CITY OF NEW BERLIN WATERSHED MAP

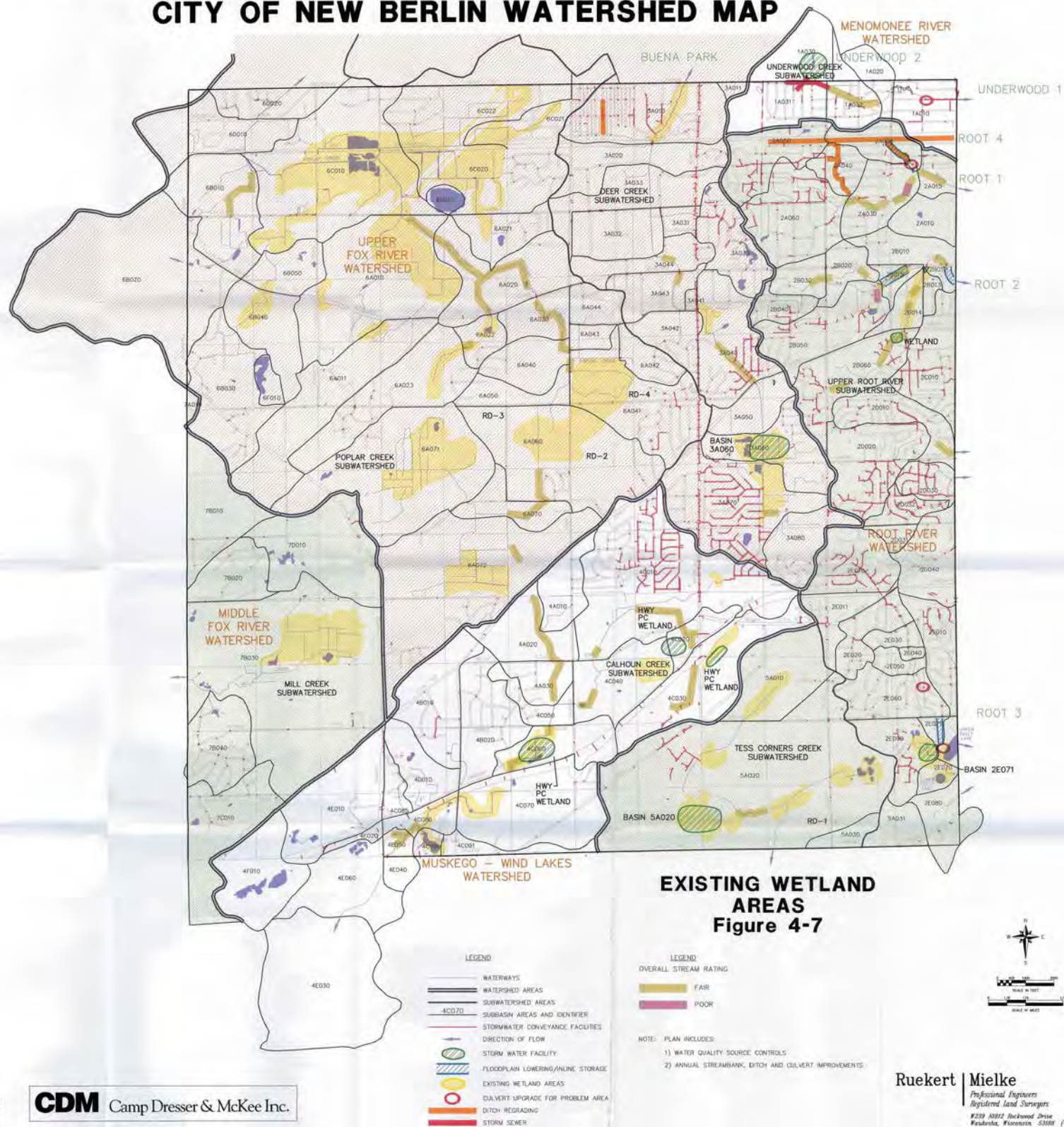


Table 4-3: Summary of Wetland Areas within the New Berlin Study Area

Subwatershed	Total Acres of Wetlands Inventoried	Acres of Existing Wetlands	Acres of Prior Converted Wetlands	Total Value Acres ¹	Total Potential Acres ²
Deer Creek	172.0	79.8	92.2	63.3	108.7
Upper Root River	37.6	37.6	0.0	37.6	0.0
Tess Corners	116.9	53.5	63.4	53.5	96.3
Underwood Creek	--	--	--	--	--
Calhoun Creek	242.4	140.4	102	134.8	107.6
Poplar Creek	1982.4	776.9	1205.8	732.1	1542.0
Mill Creek	249.3	123.8	125.5	123.8	125.5

notes: 1- total value acres = the total acres with a current value (effectiveness) rating of moderately-high or greater.

2- total potential acres = the total acres with a potential for additional effectiveness (opportunity) rating of moderately high or higher.

A more detailed summary of the analysis results including the evaluation of each inventoried wetland is presented in Appendix C.

The evaluation of the wetland areas indicates that:

- 1,145 acres, 41 percent, of the wetland areas inventoried currently have at least moderately high value for surface water quality and flow improvement.
- 1,982 acres, 71 percent, of the wetland areas inventoried currently have at least moderately high additional potential for surface water improvement.
- A majority of the wetland areas with high potential for storm water management are in prior converted wetland areas. Many of the prior converted wetlands have been ditched.
- Ditching has substantially impacted the hydrology of 74 percent of the wetland areas inventoried.
- The area with the highest potential for storm water management is located northwest of the City of New Berlin, within the Poplar Creek watershed.
- All of the wetland areas inspected in the City of New Berlin were disturbed, most of them severely.

Although all of the existing wetland areas identified in the inventory were disturbed by urban development, two areas maintain a high value as a wetland area and should be protected from future disturbance. The wetland areas which are identified as having the greatest value are summarized in Table 4-4.

Table 4-4: Significant Wetland Areas within the New Berlin Study Area

Subwater shed	Wetland Reference Number: Location	Area (acres)	Importance
Poplar Creek	5-1: North of railroad tracks and south of the intersection of Birchwood Lane and Norwood Drive	36	These wetland areas are important because they contain tamarack conifer swamp, which was one of the most common presettlement wetland vegetation types of New Berlin.
	5-3: South of railroad tracks and northeast of the intersection of Lincoln Avenue and Johnson Road	197	These wetland areas are important ecologically because they contain an uncommon species of goldenrod, <i>Solidago ohioensis</i> , Ohio goldenrod.

Section 5

Storm Water Management System Analysis

5.1 Introduction

A computer analysis was conducted of the Primary Storm Water Management System (PSMS), in the City of New Berlin. The objectives of this analysis were to:

- evaluate the capacity and performance of major drainage structures,
- determine the extent of floodplain areas,
- assess the magnitude of future increases in flows and flood elevations due to likely future development areas, and
- identify existing and possible future capacity problems.

The results of the computer analysis were incorporated into the system-wide capacity analysis. The results of the analyses provided information for the identification of storm water quantity problems and development of both flood control and water quality solutions.

The system analysis consisted of the following tasks:

- Definition of the Primary Storm Water Management System
- Assembly of watershed surface runoff data
- Preparation of hydrologic model information
- Assembly of conveyance system data
- Formulation of the hydraulic model
- System analysis for existing and future land use

Procedures used to complete the analysis are presented in the following sections.

5.2 Definition of the Primary Storm Water Management System (PSMS)

The Primary Storm Water Management System (PSMS) is the system of channels and culverts designed to safely convey major storm flows to a downstream outfall.

Usually, the PSMS is defined as channels and watercourses draining at least 160 acres and, it is almost always designed to convey the 1 percent chance of exceedance flow rate. The one percent chance flow is also commonly called the 100-year storm event.

The PSMS in New Berlin is divided into seven independent subwatersheds. Three of the subwatersheds drain to the east toward Lake Michigan via Underwood Creek, the

Upper Root River, or Tess Corners Creek, while the remaining four subwatersheds drain to the Muskego Lake or the Fox River, which are part of the Mississippi River Basin. The Fox River tributaries are Deer Creek, Poplar Creek, Calhoun Creek, and Mill Creek.

The boundaries of these major subwatersheds are shown on Figure 1-1. The PSMS in each of these subwatersheds is identified within each watershed and is also shown in Figure 1-1. The extent of the PSMS was defined by tracing the major open channels back to their inceptions as shown on USGS topographic maps. If the drainage area exceeded 160 acres, the system was extended based on New Berlin 1/4 section maps. Data describing the PSMS in each major subwatershed is presented in Table 5-1.

Table 5-1: New Berlin Primary Storm Water Management System

Number	Subwatershed	Area (acres)	Channel Length (miles)	Number of Primary System Culverts
1	Underwood Creek	667	1.28	2
2	Upper Root River	4106	5.55	30
3	Deer Creek	2771	4.25	11
4	Calhoun Creek	4821	6.15	14
5	Tess Corners Creek	1707	0	0
6	Poplar Creek	8992	5.06	17
7	Mill Creek	2393	0	0

A listing of subwatershed parameters, including the anticipated runoff and runoff rate, is provided in Appendix D.

5.3 Hydrologic Model Development

The hydrologic computer model used to evaluate the New Berlin PSMS is the RUNOFF module of the USEPA Storm Water Management Model (SWMM). This model calculates the storm flow hydrograph for each subbasin based on a particular rainfall storm. Key model inputs include subbasin physical parameters such as area, percent impervious, land use, and soils, and the depth and distribution of the desired rainfall. A separate hydrologic model was created for each of the seven major subwatersheds. Models were formulated for both existing and future land use conditions. Verification of modeled flows was conducted based on previous experience with road overtopping and overbank flooding. Model flows were also checked for consistency with the published flood insurance study flows.

To develop the hydrologic model, each major subwatershed was delineated into a series of subbasins. As described in Section 4.3, subbasins were delineated in the

manner necessary to define flows at culvert crossings and major stream confluences and generally ranged in size from 10 to 900 acres. A total of 122 subbasins were delineated.

The hydrologic model requires physical parameters describing the runoff characteristics of each subbasin. The physical parameters and procedures to derive these parameters are:

- Subbasin Area: Delineated on 1"-100' scale Southeastern Wisconsin Regional Planning Commission (SEWRPC) topographic maps. The areas were determined using an electronic planimeter.
- Percent Impervious: Based on proportions assigned to standard land uses identified in Appendix D.
- Current Land Use: Proportion of standard land uses in each subbasin were estimated from aerial photos and compared to the City's land use plan.
- Future Land Use: Future development within each subbasin was determined by using the New Berlin Zoning Map.
- Flow Path Analysis: The length, roughness, and slope of the typical subwatershed overland flow paths are required to calculate the effective subbasin width. This characteristic width is used to compute the overland flow velocity which controls the travel time. The flow path data were measured in each subbasin from the SEWRPC 1"-100' scale maps. The average length and slope of two or three flow paths were used to characterize each subbasin.
- Soils: A map of hydrologic soils groups in New Berlin was developed from the Natural Resource Conservation Service publication *Soil Survey of Milwaukee and Waukesha Counties* (1971).

5.4 Rainfall Input

Hydrologic analysis was conducted for rainfall event recurrence intervals of 2, 10, 25, and 100-years. Rainfall depths for these frequencies were obtained from data prepared by the Midwest Climate Center and published as Bulletin 71 of the Illinois State Water Survey (1992). Bulletin 71 is an interim source of rainfall information used to replace outdated information previously published by SEWRPC and the National Weather Service. SEWRPC is currently preparing revised design rainfall depths which are anticipated to be published in 1999.

The Bulletin 71 rainfall depth duration data is shown in Table 5-2. The rainfall must be distributed through time for use in the model. This was done according to rainfall distributions published in Bulletin 71. The structure of these distributions is shown in Appendix D.

Table 5-2: Bulletin 71 - Rainfall Depths in Inches

Recurrence Interval (years)	Storm Duration in Hours					
	1	2	3	6	12	24
2	1.27	1.57	1.73	2.03	2.35	2.70
5	1.57	1.93	2.13	2.50	2.90	3.33
10	1.81	2.24	2.47	2.89	3.36	3.86
25	2.19	2.70	2.98	3.49	4.05	4.66
50	2.53	3.12	3.44	4.03	4.68	5.38
100	2.93	3.62	3.99	4.68	5.43	6.24

The total amount of rainfall varies according to the specified storm duration. Longer storms have greater rainfall volume but less rainfall intensity. The New Berlin system was evaluated for several storm durations to determine the combination of duration and intensity that produces the greatest peak runoff rate. The analysis showed that the 3-hour storm produced the greatest peak flow in each subwatershed except for the South Branch of Underwood Creek. The 1-hour storm is the critical event in the South Branch of Underwood Creek subwatershed.

5.5 Conveyance System Data

The conveyance system consists of the stream channels and roadway crossing structures that provide for drainage of storm water flows. The hydraulic analysis required channel data includes, typical channel cross-sections, the Manning roughness coefficient, and the upstream and downstream flow line elevations. The channel data was taken from existing flood insurance study computer models of the stream reaches. Additional cross-sections were obtained from SEWRPC 1" = 100' scale topographic maps. The hydraulic analysis also requires data for culverts and bridges. The required culvert and bridge data include, the upstream and downstream invert elevations, the Manning roughness values, waterway opening dimensions, structure length, and the road overtopping elevation. The culvert data was obtained from the 1" = 100' scale drainage system maps prepared by Ruekert & Mielke.

5.6 Hydraulic Model Development

The EXTRAN module of SWMM was used to conduct hydraulic analysis of the New Berlin PSMS. The objective of the hydraulic analysis is to determine the depth of flow in the open channels that make up the primary system. The hydraulic analysis also evaluates the performance of roadway culverts in the primary system.

Five separate EXTRAN models were developed, one model for each of the five major subwatersheds within the New Berlin study area. There is no primary drainage

system in the Mill Creek or Tess Corners subwatersheds within New Berlin. The miles of channel and number of hydraulic structures represented in each model for each subwatershed is presented in Table 5-1.

5.7 Hydraulic Analysis Results

The hydraulic analysis models were run using the 2-, 10-, 25-, and 100-year recurrence interval storm event runoff flows as input. The models were run under both existing land use and future land use conditions. The results of the hydraulic analysis consist of the flow rate, velocity, and depth at each location considered in the hydraulic model. This information can be used to identify areas of high flood level, channel and culvert capacity shortfalls, and areas of high erosion potential. The complete results of the hydraulic analysis are provided in the Appendix D. Model results at the major culverts within the study area are shown in Table 5-3. Four of the modeled major system culverts have less than the 2-year recurrence interval storm event capacity. Road overtopping in the 25-year recurrence interval storm event or less was detected at 28 of the major culvert locations in the model including 12 locations where overtopping occurs in the 10-year recurrence interval storm event or less.

Differences between existing and future land use flows are shown in Table 5-4 for selected locations in each subwatershed. Flow increases are greatest in the Calhoun Creek, Deer Creek, and Poplar Creek subwatersheds, while flow increases are the smallest in the Underwood Creek and Upper Root River subwatersheds. The flow increases are typically due to future development within the subwatershed.

Table 5-4: Existing and Future Land Use Flows at Selected Locations

Location	Existing Land Use Flow (cfs)	Future Land Use Flow (cfs)	Percent Change (%)
Upper Root River at 124th Street	650	700	8
Deer Creek at Rogers Drive	1,250	1,522	22
Deer Creek at Moorland Road	534	579	8
Deer Creek at National Avenue	489	547	12
Calhoun Creek at City Limit	620	635	11
Calhoun Creek at upstream of Racine Drive	290	310	17
Calhoun Creek at upstream of Calhoun Road	300	320	22
Underwood Creek at Meadow Lane	380	400	6
Poplar Creek at Cleveland Avenue	114	136	19

5.8 Citywide Culvert Capacity Analysis

An extensive culvert capacity analysis was completed to estimate the capacity and level of service provided by all identified culverts in New Berlin greater than 18 inches in size. The nominal capacity of each culvert was calculated based on its size, shape, construction material, and slope. Culverts were assumed to have sufficient headwater to cause them to flow full, and assumed to be unobstructed. Each was evaluated for inlet control and barrel control and the limiting flow condition was taken as the capacity. An entrance loss coefficient of between 0.1 and 0.5 was used to represent entrance conditions. Additional information regarding the capacity analysis calculations is presented in Exhibit C-4 in Appendix D.

Design flows corresponding to the 10-year and 100-year storms were estimated at each culvert location. These flows were determined by delineating the area tributary to each culvert and multiplying the area by unit flows obtained from the SWMM model results.

The capacity analysis results are presented in Appendix D. The level of service provided by each culvert has been determined by comparing the design flows to the nominal capacity. Culverts in the minor storm water management system should provide at least 10-year capacity. Culverts included in the primary storm water management system should provide at least the 100-year level of protection for capacity and road overtopping. The analysis results indicate that 115 of the analyzed culverts do not meet these criteria. Of the 115 undersized culverts, 32 are primary system culverts and 83 are secondary system culverts. A program to address these deficiencies is presented in Section 8 of this plan.

Table 5-3: Flow Capacity and Overtopping Results at Primary System Culverts

Street Name	Subwatershed	Culvert ID	Culvert Description	Capacity (cfs)	Future Conditon Flow (cfs)				Level of Protection	
					2yr	10yr	25yr	100yr	Flow Capacity	Road Overtopping*
124th Street	Root	24.04.08/09	38" x 54" Arch	180	251	318	434	695	<2 year	2 year
124th Street		13.02.06/07/08	72" x 100" & 2@ 48"	654	228	417	453	693	<100 year	100 year
Lagoon Road		12.01.06/07	2 @ 67" x 95" Arch	750	228	360	452	698	100 year	100 year
Cleveland Avenue		12.01.08	97" x 128" Arch	1069	216	336	418	631	100 year	100 year
128th Street		12.01.03/12.04.06	2 @ 60" CMP	422	130	220	280	434	<100 year	100 year
130th Street		12.04.01/02	2 @ 60" RCP	422	124	206	262	408	100 year	100 year
132nd Street		12.03.16/17	2 @ 48" CMP	242	130	210	262	413	<25 year	25 year
133rd Street		12.03.13/14	2 @ 48" RCP	242	130	214	266	414	<25 year	25 year
Dakota Street		12.03.11/12	2 @ 48" RCP	242	42	90	141	204	100 year	100 year
Sunny Slope Road		11.04.22	60" RCP	211	27	48	76	132	100 year	100 year
Dakota Street		12.03.08	15" x 30" ACMP	14	24	34	45	68	<2 year	100 year
128th Street South		12.04.05	48" RCP	121	83	110	127	164	<25 year	25 year
130th Street		12.04.01	48" RCP	121	93	132	195	266	<10 year	25 year
National Avenue		12.04.03	48" RCP	211	118	157	217	338	<25 year	2 year
124th Street		12.04.07	47" x 71" Arch	187	87	121	160	287	<100 year	25 year
124th Street		24.04.17	69" x 72" Box	308	28	50	78	142	100 year	100 year
Weatherstone Boulevard		24.01.12/13	38" x 57" & 43" x 64" Arches	253	15	25	40	73	100 year	100 year
South Carnaby Lane		24.01.18/19	38" x 57" & 43" x 64" Arches	253	15	25	39	73	100 year	100 year
Victoria Circle		24.01.14/15	38" x 57" & 43" x 64" Arches	281	6	10	15	28	100 year	100 year
Coldspring Road		24.01.16	24" CMP	21	9	13	17	29	<100 year	100 year
St. Mary's Drive		36.01.06/07	2 @ 11'x3' Box	416	106	180	236	338	100 year	25 year
Grange Avenue		25.04.05	48" CMP	287	106	174	230	362	< 100 year	100 year
Marquette Drive		25.04.14/15/16	3 @ 38" x 57" Arch	327	87	132	170	274	100 year	100 year
Balboa Drive		25.04.08/09	2 @ 38" x 57" Arch	118	82	118	154	251	< 25 year	25 year
Cherrytree Lane		25.01.19/20	2 @ 38" x 57" Arch	218	84	118	156	277	<100 year	25 year
Radisson Court		25.01.12/13	2 @ 38" x 57" Arch	210	94	138	170	275	<100 year	25 year
Marin Way		25.01.37/38	2 @43" x 68" Elliptical	286	76	118	144	202	100 year	100 year
Beloit Road		25.01.33/34	2 @ 7'x3' Box	327	48	72	90	125	100 year	100 year
Rock Freeway (I-43)		25.02.19	5'x5' Box	211	51	79	101	148	100 year	100 year
Frances Street		36.01.05	35" x 24" Arch	36	15	27	31	87	< 100 year	10 year
Rock Freeway (I-43)	Calhoun	34.02.09/10	2 @ 30" RCP	74	2	6	7	8	100 year	100 year
Racine Place		32.04.17	5' x 8' Box	357	161	258	344	457	<100 year	100 year
College Avenue		32.04.06/07	2 @ 60" RCP	422	103	178	242	324	100 year	100 year
Racine Drive		105.02.04	72" CMP	333	100	175	236	311	100 year	100 year
Tans Drive		105.02.01	48" RCP	333	116	187	269	467	<100 year	2 year
Rock Freeway (I-43)		33.03.08	10'x7' Box	593	131	211	271	404	100 year	100 year
Rock Freeway (I-43)		33.03.07	18'x8' Box	1762	141	293	440	766	100 year	100 year
Beres Road		28.04.15/14/13	2 @ 60" CMP	444	148	297	461	825	<25 year	<2 year
Calhoun Road		27.01.01/02	2 @ 48" x 60" Arch	284	184	274	426	729	<25 year	2 year
Rock Freeway (I-43)		27.04.06/07	2 @ 48" RCP	224	153	254	336	488	<10 year	25 year
Rock Freeway (I-43)		26.02.16	42" RCP	87	15	35	62	122	<100 year	100 year
Rock Freeway (I-43)		26.02.09/10	6'x10' Box	500	61	94	125	188	100 year	100 year
Martin Road		33.03.05/02.05	2 @ 36" CMP	118	59	90	120	197	<25 year	10 year
Beloit Road		26.02.07	52" CMP	137	26	36	65	168	<100 year	25 year
Greenfield Avenue	Deer	03.01.16	6'x10' Box	1069	587	885	1060	1341	<100 year	100 year
C & NW Railroad		03.01.11/12	2 @ 84" CMP	980	562	840	1006	1250	<25 year	100 year
Rogers Drive		03.04.06	5.2'x20' Box	1342	484	741	884	1120	100 year	2 year
Lincoln Avenue		03.04.05	5.2'x10' Box	527	397	617	744	1100	<10 year	10 year
Glendale Drive		10.01.01/06	5.8'x12' Box	1320	586	960	1178	1610	<100 year	100 year
Cleveland Avenue		10.03.01/02/03	3 @ 72" CMP	999	750	1242	1530	2016	<10 year	100 year
James Drive		10.04.02/03/04	3 @ 5'x10' Concrete Box	1128	600	1008	1269	1737	<25 year	100 year
Moorland Road		10.04.15/16	2 @ 8'x9' Box	1544	394	668	842	1158	100 year	100 year
West San Mateo Drive		14.02.05	8'x16' Box	1690	185	314	397	548	100 year	100 year
National Avenue		14.02.06	10'x10' Box and 63" x 98" Elliptical	366	185	313	398	547	<25 year	100 year
162nd Street	Poplar	10.01.06	5' RCP	660	45	73	95	134	100 year	100 year
Cleveland Avenue		09.04.01/02	2 @ 54" RCP	324	230	368	422	502	<10 year	100 year
Calhoun Road		16.01.08/09/10	3 @ 60" RCP	633	221	363	456	597	100 year	100 year
Calhoun Road		16.01.11/12/13	3 @ 80" CONC , 2 @ 5' RCP	1302	243	408	612	1191	100 year	100 year
Coffee Road		16.01.01/02/03	3 @ 66" RCP	804	234	396	630	1179	<100 year	100 year
Observatory Road		21.01.01	36" x 72" Arch	105	157	239	302	357	<2 year	100 year
Observatory Road		21.01.03	72" x 102" Arch	453	123	193	318	556	<100 year	25 year
Cleveland Avenue		08.03.09/10	2 @ 42"	108	94	111	119	136	<10 year	< 2 year
Cleveland Avenue		09.03.01/02	30" & 60" CMP	246	46	72	95	184	100 year	100 year
Willow Road		16.02.04	24" x 35" Arch	33	33	40	45	53	2 year	< 2 year
166th Street		15.02.01/02/03	3 @ 45" x 66" Box	444	39	61	78	113	100 year	100 year
Victor Road		15.02.06/07	3 @ 36" x 58" Arch	315	99	163	207	287	100 year	25 year
Ryerson Drive		10.03.06/07	2 @38" x 57" Arch	220	63	104	136	208	100 year	100year
C & NW Railroad		04.01.18	48" RCP	121	22	58	84	116	100 year	100 year
Gravel Road		05.03.09	21" RCP	15	6	8	14	27	<100 year	25 year
Lincoln Avenue		06.04.05	18" x 24" Arch	14	6	9	25	29	<25 year	10 year
Cleveland Avenue		07.02.01	63" x 87" Arch	369	15	50	82	150	100 year	100 year
Arcadian Drive	Underwood	01.02.10	47" x 71" Arch	177	127	174	206	272	<25 year	50 year
Elm Grove Road		01.01.12	47" x 71" Arch	138	136	200	245	337	<10 year	2 year

* Road overtopping can occur even though the flow capacity is not exceeded when there is backwater from downstream.

Section 6

Water Quality Analysis

6.1 Introduction

A water quality analysis was conducted to estimate the amount of pollutants that are discharged to the major streams within New Berlin via storm water runoff. The water quality analysis was conducted using a unit-area loading model which is based in part on the Source Loading and Management Model (SLAMM) developed by the WDNR.

The type and amount of pollutants carried with storm water depend on the types of land use. Transportation, industrial, and commercial areas are typically major contributors of sediments and metals due to vehicular traffic and outside material storage. Residential areas typically contribute sediment and metals, along with pesticides, fertilizers, and bacteria. The pollutant loading rate for residential areas varies with the density of development. Park and open space areas generally contribute relatively minor amounts of metals and sediment. Park areas typically contribute significant amounts of nutrients due to landscaping practices.

The type of storm water conveyance system affects the quality of the storm water runoff. Grassed swales, when properly designed and maintained, filter out pollutants and reduce runoff quantity through infiltration. Engineered storm sewer systems convey runoff and pollutants to the receiving stream without an opportunity for filtration.

The water quality analysis was conducted for five pollutants: sediment, phosphorous, copper, lead, and zinc. These five pollutants are associated with urban storm water runoff and often cause water quality problems in urban streams as identified in Table 6-1.

Table 6-1: Major Storm Water Pollutants, Sources, and Water Quality Impacts

Pollutant	Typical Sources	Water Quality Impacts
Sediment	Soil, atmospheric deposition (dust), litter and debris, particles from automobiles and tires, deteriorated pavement	Decreases water clarity, covers valuable plants and bottom dwelling organisms, destroys breeding sites, reduces aquatic plant photosynthesis
Phosphorous	Fertilizer, organic matter (leaves, grass clippings), soil	Excessive algal growth, dissolved oxygen reduction, odors
Copper	Automobile brake pads, wire, roof materials	Toxic to aquatic life
Lead	Atmospheric deposition, automobiles, paint, medical equipment	Toxic to aquatic life
Zinc	Galvanized steel roof drains and downspouts, coatings, rubber products	Toxic to aquatic life

A separate industrial pollutant loading analysis was conducted to further evaluate the amount of pollutants discharged to storm water runoff from industries within the City of New Berlin. The analysis was conducted for conventional and toxic pollutants anticipated being discharged in storm water from various types of industries. The objective of the industrial analysis is to determine the pollutants with the highest loading rate from industries within New Berlin, the industries with the greatest potential for contributing significant storm water pollutant loadings, and identification of selected best management practices which, when implemented will reduce the pollutant loading.

6.2 Water Quality Analysis Methodology

6.2.1 Study Area Analysis

The amount of pollutants which are contained in storm water runoff discharging to the major streams within the City of New Berlin were estimated using a unit-area loading rate model. The analysis was based on the following information:

- Land use in accordance with the areal photographs, land use maps, and other information provided by the City of New Berlin. Land use was calculated for the study area under current (1995) and future development conditions as shown on the zoning map. Land use conditions are described in Section 3.2 of this report.
- Pollutant loading rates for each land use category based on previous studies using the Source Loading and Management Model, research results, and professional judgement. The pollutant loading rates utilized in the model are presented in Table 6-2.
- Existing storm water control practices and study area characteristics including use of drainage swales or retention ponds.

Table 6-2: Unit Area Pollutant Loading Rates for the City of New Berlin Study Area

Land Use	Unit Area Loading Rates (lb./ac./yr.)				
	Sediment	Phosphorous	Lead	Copper	Zinc
Wetland, Forest, Preservation	3	0.03	0.01	0.01	0.01
Park	417	2.81	0.01	0.01	0.06
Institutional / Business Park	421	1.80	0.18	0.08	1.09
Low Density Residential	205	0.19	0.13	0.06	0.08
Medium Density Residential	410	0.38	0.26	0.11	0.16
High Density Residential	574	0.52	0.36	0.16	0.22
Commercial	1056	1.07	2.7	0.4	2.10
Industrial	430	0.14	1.2	0.25	3.65
Highway	1003	2.20	5.730	0.62	2.60
Arterial	288	1.12	0.056	0.15	0.56
Agriculture	450	0.86	0.01	0.01	0.01
Construction	6,000	2.2	0.23	0.09	0.3
Extractive, Landfill	3,344	0.09	0.01	0.01	0.01
Open Water	185	0.13	0.04	0.04	0.04

6.2.2 Industrial Analysis

The industrial pollutant loading analysis was conducted to further evaluate the amount of pollutants discharged to storm water runoff from industries within the City of New Berlin. The analysis was based on the following information:

- Industrial facility information including Standard Industrial Classification (SIC) Code, acres, and percent impervious. The industrial facility information was provided by the City of New Berlin through tax records and the New Berlin Industrial Park Directory.
- Pollutant loading rates for specific types of industries based on storm water sampling data collected from 6,500 industrial facilities nationwide as part of the U.S. Environmental Protection Agency's (USEPA's) group industrial storm water permitting program.

6.3 Water Quality Analysis Results

6.3.1 Study Area Analysis

The water quality analysis summarizes the annual anticipated pollutant loadings, in pounds per year, by land use category and by subwatershed / subbasin designation. The results can then be used to target appropriate best management practices (BMPs) to effectively reduce the pollutant loadings in critical areas.

The analysis indicates that construction, extractive, commercial, and highway land use contributes the highest loading of sediment per acre, while parks, highways, and construction land use contributes the highest loading of phosphorous per acre, and commercial, industrial, and highway land use contributes the highest per acre loading of metals. Based on total loadings of pollutants from the City of New Berlin:

- agriculture and residential land use account for 49 and 44 percent of the total sediment loading under existing and future conditions, respectively;
- extractive land use accounts for more than 20 percent of the total sediment loading;
- agriculture and park land use account for 57 and 46 percent of the phosphorous loading under existing and future conditions, respectively;
- commercial, industrial, and highway land use account for 46 to 78 percent of the total metals loadings under existing and future land use conditions; and
- the total sediment and phosphorus loadings are reduced by 12 and 6 percent, respectively from existing to future conditions while metal loadings are increased by more than 30 percent due to development of agricultural lands.

The annual anticipated pollutant loadings, by land use, under the existing and future land use conditions are presented on Table 6-3 and 6-4. The distribution of the annual pollutant loading by land use for existing and future conditions is shown on Figure 6-1. A comparison of the total annual pollutant loadings under existing and future conditions is shown on Figure 6-2.

Tables 6-5 and 6-6 present a summary of the annual anticipated loadings by subwatershed within the City of New Berlin under existing and future conditions. Generally, the subwatersheds which contribute the highest pollutant loading correlate with the land uses discussed above. In order to reduce the influence of the subwatershed size on the pollutant loadings, a pound per acre per year loading was evaluated for each subwatershed. The sediment and metals pollutant loading, based on pounds per acre per year, varies in accordance with the percentage of urban land use. The phosphorous pollutant loading, based on pounds per acre per year, does not vary significantly between subwatershed. A comparison of pollutant loadings based on pounds per acre per year is presented in Figure 6-3.

The water quality model results are presented in Appendix E.

**Table 6-3: Existing Annual Pollutant Loadings By Land Use
City of New Berlin - Storm Water Management Study**

Land Use	Area (acres)	Pollutant														
		Sediment			Phosphorous			Lead			Copper			Zinc		
		(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)
Wetland, Forest, Preservation	5,147	15,442	3	0%	154	0.0	1%	51	0.01	1%	51	0.01	4%	51	0.01	1%
Agriculture	7,152	3,218,257	450	30%	6,150	0.9	47%	72	0.01	1%	72	0.01	5%	72	0.01	1%
Park	478	199,488	417	2%	1,344	2.8	10%	5	0.01	0%	5	0.01	0%	29	0.06	0%
Institutional	625	262,960	421	2%	1,124	1.8	9%	115	0.18	2%	50	0.08	3%	681	1.09	9%
Low Density Residential	4,366	894,984	205	8%	838	0.2	6%	559	0.13	9%	244	0.06	17%	349	0.08	5%
Medium Density Residential	2,282	935,600	410	9%	858	0.4	7%	584	0.26	9%	256	0.11	17%	365	0.16	5%
High Density Residential	301	172,523	574	2%	156	0.5	1%	108	0.36	2%	48	0.16	3%	67	0.22	1%
Commercial	567	598,511	1,056	6%	606	1.1	5%	1,530	2.70	24%	227	0.40	15%	1,190	2.10	16%
Industrial	850	365,637	430	3%	119	0.1	1%	1,020	1.20	16%	213	0.25	15%	3,104	3.65	43%
Highway	369	370,559	1,003	3%	813	2.2	6%	2,117	5.73	33%	229	0.62	16%	961	2.60	13%
Arterial	198	56,958	288	1%	222	1.1	2%	111	0.56	2%	30	0.15	2%	111	0.56	2%
Open Water	358	66,311	185	1%	47	0.1	0%	14	0.04	0%	14	0.04	1%	14	0.04	0%
Extractive, Landfill	668	2,233,227	3,344	21%	59	0.1	0%	7	0.01	0%	7	0.01	0%	7	0.01	0%
Railroad	83	44,880	540	0%	37	0.4	0%	35	0.42	1%	0	0.00	0%	166	2.00	2%
Construction	200	1,200,000	6,000	11%	440	2.2	3%	46	0.23	1%	18	0.09	1%	60	0.30	1%
<i>Total</i>	<i>23,644</i>	<i>10,635,300</i>	<i>450</i>	<i>100%</i>	<i>12,968</i>	<i>0.5</i>	<i>100%</i>	<i>6,374</i>	<i>0.27</i>	<i>100%</i>	<i>1,463</i>	<i>0.06</i>	<i>100%</i>	<i>7,227</i>	<i>0.31</i>	<i>100%</i>

**Table 6-4: Existing Annual Pollutant Loadings By Drainage Area
City of New Berlin - Storm Water Management Plan**

Drainage Areas	Area (acres)	Pollutant														
		Sediment			Phosphorous			Lead			Copper			Zinc		
		(lb./yr.)	(lb./ac./yr)	(% Total)	(lb./yr.)	(lb./ac./yr)	(% Total)	(lb./yr.)	(lb./ac./yr)	(% Total)	(lb./yr.)	(lb./ac./yr)	(% Total)	(lb./yr.)	(lb./ac./yr)	(% Total)
Calhoun Creek	4,135	2,518,962	609	24	2,534	0.6	20	1,975	0.48	31	316	0.08	22	1,179	0.29	16
Upper Root River	4,106	1,636,176	399	15	2,485	0.6	19	1,191	0.29	19	312	0.08	21	971	0.24	13
Tess Corners Creek	1,707	553,124	324	5	1,008	0.6	8	266	0.16	4	63	0.04	4	247	0.14	3
Underwood Creek	462	184,459	399	2	284	0.6	2	133	0.29	2	47	0.10	3	168	0.36	2
Deer Creek	2,769	1,211,690	438	11	1,347	0.5	10	1,382	0.50	22	319	0.12	22	2,582	0.93	36
Poplar Creek	8,075	3,125,361	387	29	3,989	0.5	31	1,162	0.14	18	337	0.04	23	1,907	0.24	26
Mill Creek	2,391	1,405,565	588	13	1,316	0.6	10	265	0.11	4	69	0.03	5	173	0.07	2
<i>Total</i>	<i>23,644</i>	<i>10,635,300</i>	<i>450</i>	<i>100</i>	<i>12,962</i>	<i>0.5</i>	<i>100</i>	<i>6,374</i>	<i>0.27</i>	<i>100</i>	<i>1,463</i>	<i>0.06</i>	<i>100</i>	<i>7,227</i>	<i>0.31</i>	<i>100</i>

**Table 6-5: Future Annual Pollutant Loadings By Land Use
City of New Berlin - Storm Water Management Study**

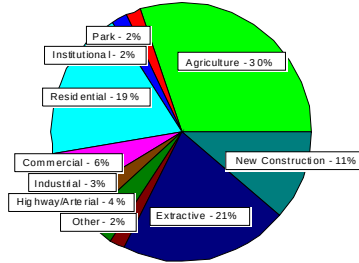
Land Uses	Area (acres)	Pollutant														
		Sediment			Phosphorous			Lead			Copper			Zinc		
		(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)
Wetland, Forest, Preservation	4,596	13,789	3	0	138	0.0	1	46	0.01	1	46	0.01	2	46	0.01	0
Agriculture	2,925	1,316,077	450	14	2,515	0.9	21	29	0.01	0	29	0.01	1	29	0.01	0
Park	1,090	454,693	417	5	3,064	2.8	25	11	0.01	0	11	0.01	1	65	0.06	1
Institutional	867	365,150	421	4	1,561	1.8	13	160	0.18	2	69	0.08	4	945	1.09	8
Low Density Residential	6,525	1,337,571	205	14	1,253	0.2	10	835	0.13	10	365	0.06	19	522	0.08	5
Medium Density Residential	2,820	1,156,363	410	12	1,060	0.4	9	722	0.26	8	316	0.11	16	451	0.16	4
High Density Residential	673	386,065	574	4	350	0.5	3	242	0.36	3	108	0.16	5	151	0.22	1
Commercial	809	854,680	1,056	9	866	1.1	7	2,185	2.70	26	324	0.40	16	1700	2.10	15
Industrial	1,662	714,777	430	8	224	0.1	2	1,995	1.20	23	416	0.25	21	6067	3.65	54
Highway	370	371,522	1,003	4	815	2.2	7	2,122	5.73	25	230	0.62	12	963	2.60	9
Arterial	199	57,404	288	1	223	1.1	2	112	0.56	1	30	0.15	2	112	0.56	1
Open Water	358	66,196	185	1	47	0.1	0	14	0.04	0	14	0.04	1	14	0.04	0
Extractive, Landfill	665	2,225,368	3,344	24	60	0.1	0	7	0.01	0	7	0.01	0	7	0.01	0
Railroad	83	44,761	540	0	36	0.4	0	35	0.42	0	0	0.00	0	166	2.00	1
Total	23,644	9,364,400	396	100	12,213	1	100	8,515	0	100	1,964	0	100	11,238	0	100

**Table 6-6: Future Annual Pollutant Loadings By Drainage Area
City of New Berlin - Storm Water Management Study**

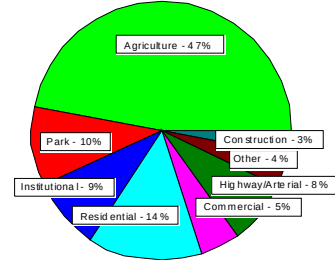
Drainage Areas	Area (acres)	Pollutant Type														
		Sediment			Phosphorous			Lead			Copper			Zinc		
		(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)	(lb./yr.)	(lb./ac./yr.)	(% Total)
Calhoun Creek	4,135	2,442,797	591	26	2,354	0.57	19	2,774	0.67	33	459	0.11	23	2,579	0.62	23
Upper Root River	4,106	1,505,222	367	16	2,376	0.58	19	1,574	0.38	18	425	0.10	22	1,208	0.29	11
Tess Corners Creek	1,707	526,783	309	6	973	0.57	8	315	0.18	4	80	0.05	4	495	0.29	4
Underwood Creek	462	186,176	403	2	288	0.62	2	140	0.30	2	48	0.10	2	175	0.38	2
Deer Creek	2,769	1,203,665	435	13	1,325	0.48	11	1,713	0.62	20	401	0.14	20	3,507	1.27	31
Poplar Creek	8,075	2,394,781	297	26	3,453	0.43	28	1,676	0.21	20	460	0.06	23	3,062	0.38	27
Mill Creek	2,391	1,104,991	462	12	1,443	0.60	12	323	0.14	4	92	0.04	5	212	0.09	2
<i>Total</i>	<i>23,644</i>	<i>9,364,416</i>	<i>396</i>	<i>100</i>	<i>12,213</i>	<i>0.52</i>	<i>100</i>	<i>8,515</i>	<i>0.36</i>	<i>100</i>	<i>1,964</i>	<i>0.08</i>	<i>100</i>	<i>11,238</i>	<i>0.48</i>	<i>100</i>

Existing Conditions

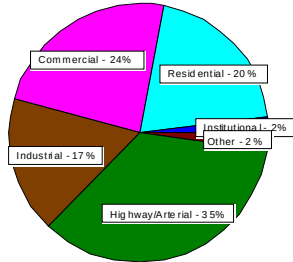
Sediment



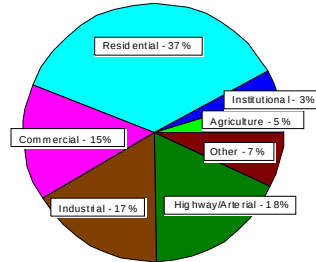
Phosphorous



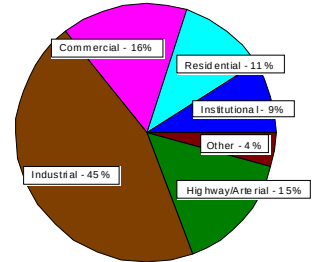
Lead



Copper

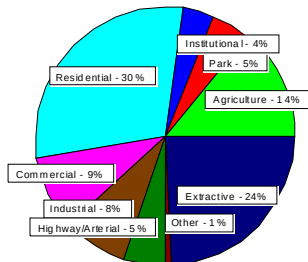


Zinc

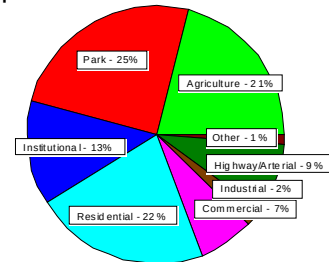


Future Conditions

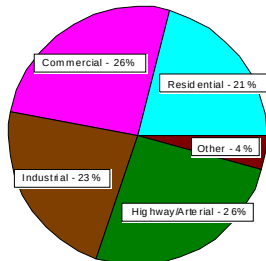
Sediment



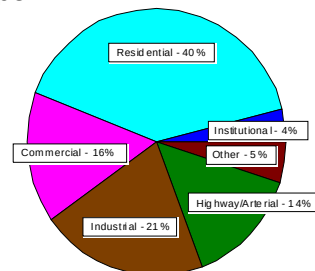
Phosphorous



Lead



Copper



Zinc

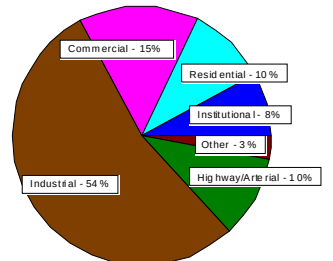
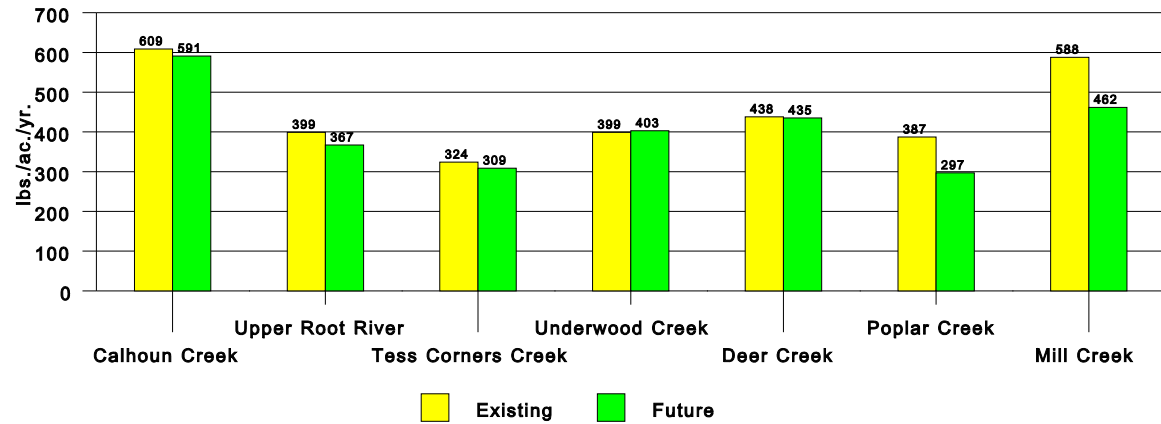
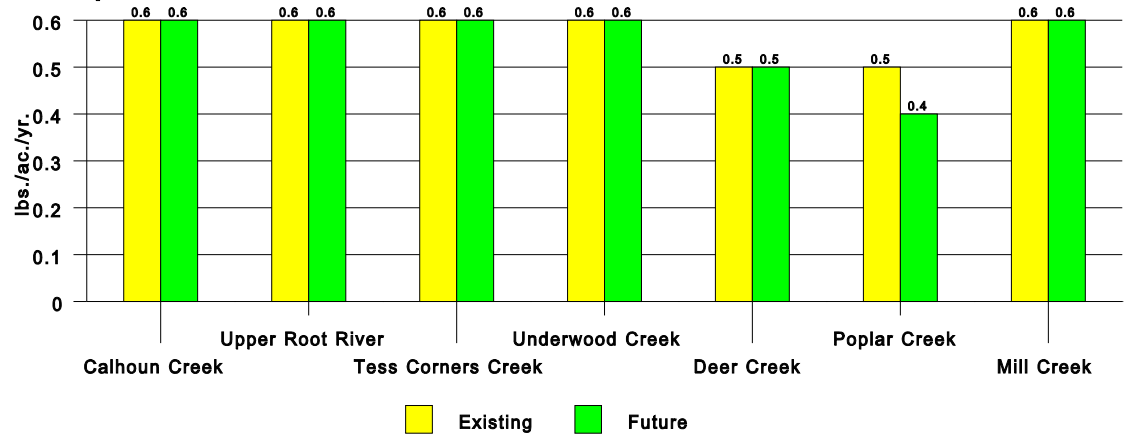


Figure 6-3: Comparison of Subwatershed Pollutant Loadings

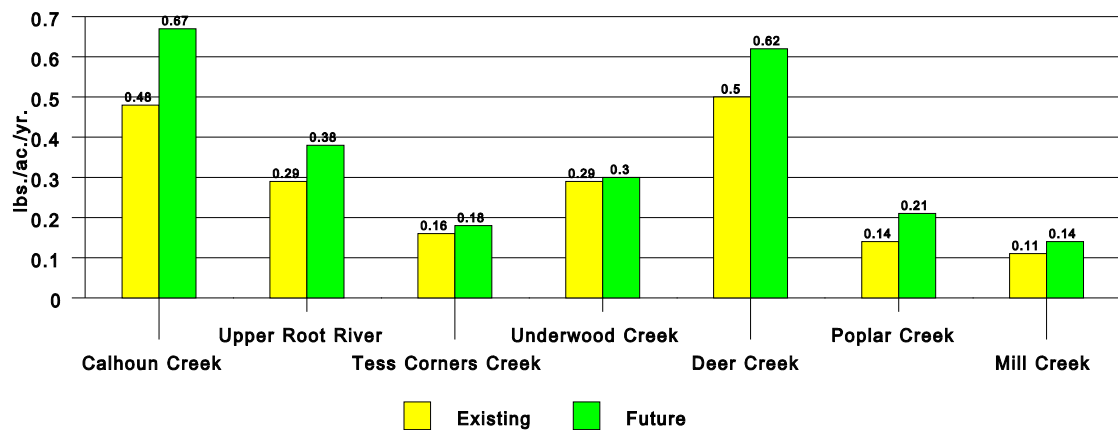
Sediment



Phosphorous



Lead



Note: The pollutant loadings for copper and zinc are not shown because the variation between the subwatersheds is similar to that shown for lead.

6.3.2 Industrial Analysis

The industrial analysis estimated storm water pollutant loadings from 182 industries within the City of New Berlin. The water quality analysis summarizes the annual anticipated pollutant loading, in pounds per year, by industrial category. The results can then be used to identify those industries that have the greatest potential for contributing significant storm water pollutant loadings and to identify appropriate best management practices for those industries.

The industries included in the analysis, are industries which, based on their SIC code, are likely required to obtain a Wisconsin Industrial Storm Water Permit. The industries are grouped into 13 different categories based on the general type of manufacturing facility. A majority of the industries included in the analysis are grouped in the categories of fabricated metal products, transportation equipment, electronics, land transportation, or printing and publishing. These industrial categories also occupy a majority of the total acres included in the analysis. A description of the industrial categories included in the analysis is presented in Table 6-7.

Table 6-7: Summary of Industrial Facilities in New Berlin

Industrial Category	Number of Facilities	Total Acres Occupied	Percent of Total Industrial Acres	Average Percent Impervious
Timber Products	6	16	4	45
Fabricated Metal Products	23	57	13	46
Transportation Equipment, Industrial & Commercial	52	101	24	54
Electronic, Electrical, Photographic and Optical	25	90	21	42
Paper & Allied Products	3	5	1	54
Chemical and Allied Products	5	5	1	46
Asphalt Paving and Roofing Materials Manufacturers and Lubricant manufacturers	1	2	1	30
Glass, Clay, Cement, Concrete, and Gypsum	2	4	1	44
Land Transportation	25	49	12	57
Food and Kindred Products	10	27	6	43
Textile Mill, Apparel and Other Fabric Products	3	10	2	69
Printing and Publishing	21	53	12	52
Rubber, Misc. Plastic Products	6	9	2	75
<i>TOTAL</i>	182	428	100	---

The industries included in the analysis are based on information provided by the City of New Berlin through tax key records and the *New Berlin Industrial Park Directory*. It should be noted that the quarries located within the City of New Berlin were not included in the industrial water quality analysis because specific information regarding these facilities was not provided. The quarries are included in the study area analysis as extractive land use areas.

The analysis indicates that five of the industrial categories, fabricated metal products, transportation equipment, electronics, land transportation, and printing and publishing, contribute over one-half of the total industrial loading of all pollutants. The industrial facilities in these five categories occupy approximately 350 acres, or more than 80 percent of the industrial areas evaluated. Based on the total loading calculated by the industrial water quality analysis:

- A majority of the industrial metals loading is contributed by fabricated metal products, transportation equipment, electronics, land transportation, and printing and publishing facilities.
- A majority of the industrial sediment loading is contributed by Timber Products and Land Transportation facilities.
- A majority of the industrial nutrient loading is contributed by transportation equipment and land transportation facilities.

The unit area pollutant loading contributed by the different types of industries vary greatly. Pollutants of Concern and the industrial category with the highest unit area loading are presented in Table 6-8.

Table 6-8: Highest Industrial Unit Area Loadings

Pollutant of Concern	Industry with the Highest Unit Area Loading
Total Suspended Solids	Timber Products
Phosphorous	Timber Products
Biochemical Oxygen Demand	Timber Products
Copper	Rubber and Misc. Plastic Products
Lead	Paper and Allied Products
Zinc	Paper and Allied Products

The annual anticipated pollutant loading, by industrial category, is presented on Table 6-9.

Table 6-9: Summary of Industrial Storm Water Pollutant Loadings

Industry Sector	Number of Facilities	Acres		Average Percent Impervious	Annual Pollutant Loading (lbs.)																					
		Total Acres	% of Total		Lead		Zinc		Cadmium		Chromium		Copper		Nickel		Total Suspended Solids		Total Phosphorous		Total Kjeldahl Nitrogen		Chemical Oxygen Demand		Biochemical Oxygen Demand	
					(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)	(lbs.)	(% of total)
Timber Products	6	16	4%	45%	--	--	15.5	5%	--	--	0.8	3%	2.1	6%	--	--	14554	21%	19.6	7%	87.8	5%	6609.0	10%	877.8	9%
Fabricated Metal Products	23	57	13%	46%	4.7	12%	80.7	24%	1.0	6%	1.8	7%	3.7	11%	3.4	17%	9710	14%	36.6	13%	256.4	15%	11541.4	17%	1465.5	15%
Transportation Equipment, Industrial or Commercial	52	101	24%	54%	10.2	27%	55.3	16%	2.3	15%	10.1	41%	10.1	30%	7.9	39%	7514	11%	51.3	19%	395.7	23%	12062.4	18%	1977.6	20%
Electronic, Electrical, Photographic and Optical Goods	25	90	21%	42%	6.9	18%	24.3	7%	6.9	44%	5.4	22%	4.2	13%	5.4	27%	3782	5%	43.1	16%	273.1	16%	6484.4	10%	1378.0	14%
Paper & Allied Products Manufacturing	3	5	1%	54%	0.7	2%	13.4	4%	--	--	--	--	--	--	--	--	330	0%	0.5	0%	4.4	0%	178.8	0%	35.9	0%
Chemical & Allied Products Manufacturing	5	5	1%	56%	0.2	1%	5.2	2%	0.2	1%	0.1	1%	0.3	1%	0.2	1%	600	1%	1.6	1%	31.7	2%	803.9	1%	149.4	2%
Asphalt Paving and Roofing Materials Manufacturers and Lubricant Manufacturers	1	2	1%	30%	--	--	--	--	--	--	--	--	--	--	--	--	158	0%	0.8	0%	6.2	0%	310.1	0%	22.5	0%
Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing	2	4	1%	44%	0.1	0%	2.5	1%	0.1	0%	0.1	0%	0.5	2%	0.1	0%	2101	3%	3.1	1%	12.4	1%	540.1	1%	42.0	0%
Land Transportation	25	49	12%	57%	4.9	13%	15.6	5%	4.9	31%	1.1	4%	1.6	5%	2.0	10%	17568	25%	56.6	20%	214.7	12%	9857.6	15%	1073.6	11%
Food & Kindred Products	10	27	6%	43%	2.4	6%	6.4	2%	0.3	2%	0.5	2%	2.7	8%	0.9	5%	6240	9%	25.6	9%	146.8	8%	6606.9	10%	844.2	9%
Textile Mills, Apparel and Other Fabric Products	3	10	2%	69%	1.3	3%	9.8	3%	--	--	0.9	4%	0.8	2%	0.5	2%	938	1%	5.1	2%	70.3	4%	1687.5	3%	330.5	3%
Printing & Publishing	21	53	12%	52%	6.0	16%	100.1	29%	--	--	3.6	14%	5.5	16%	--	--	5003	7%	25.0	9%	188.4	11%	7696.3	11%	1231.5	13%
Rubber, Misc. Plastic Products, and Misc. Manufacturing	6	9	2%	75%	0.5	1%	11.7	3%	--	--	0.3	1%	2.3	7%	--	--	2055	3%	7.9	3%	51.4	3%	2943.0	4%	369.0	4%
Total	182	428	100%	--	37.9	--	340.4	--	15.7	--	24.7	--	33.8	--	20.3	--	70552	--	276.8	--	1739.2	--	67321.4	--	9797.6	--

Section 7

Problem Area Identification

7.1 Introduction

The analysis described in the previous sections of this report identified potential problem areas related to flooding and drainage, streambank stability, culvert capacity and blockage, and water quality. This section presents a description of the problem areas and the methods used to identify the potential problems.

A variety of flooding and drainage problems have been reported to the City of New Berlin by its residents and public officials. The problems are classified as either primary or minor according to whether they are located on the primary storm water management system or not. The flooding problems associated with primary and minor systems are discussed in Section 7.2. The storm water management plan will address the primary system problems only.

The hydraulic structure inventory, described in Section 4, evaluated culverts for various deficiencies including insufficient flow capacity, backwater effects, and road over topping. Section 7.3 presents the culverts identified as having deficiencies. In addition to capacity, another key problem concerning culverts is blockage or obstruction of culverts. During the inventory culverts were identified as partly or substantially blocked. A summary of the blocked culverts was submitted directly to the City of New Berlin for prompt maintenance.

Drainage problems were identified based on evaluation of 556 ditch segments located within the study area. A segment is a road ditch along one side from one road crossing to the next road crossing. Erosion, sedimentation, vegetation, trash, and standing water are the criteria under which possible drainage problems were identified. Drainage ditch problems are discussed in Section 7.4.

The streambank inventory, described in Section 4, evaluated the channel stability of the major streams within the City of New Berlin. Each reach was rated as either excellent, good, fair, or poor. The stream reaches rated as fair or poor are considered generally unstable and should be repaired and/or stabilized. Section 7.5 describes the unstable reaches.

The water quality analysis, described in Section 6, identified critical land uses which contribute a majority of the storm water pollutants and areas which are significant contributors of pollutants within the City of New Berlin. Industries which have the greatest potential for contributing significant storm water pollutant loadings are also identified. Section 7.6 describes the critical land uses, the areas which are significant storm water pollutant contributors, and the industrial areas which have the greatest potential for contributing significant storm water pollutant loadings.

7.2 Flooding Problem Areas

There is a wide range of perceived flooding and drainage problems experienced by the residents of New Berlin. Not all of these problems can be solved within the context of a storm water management plan, while other problems may not be cost effective to solve.

Flood problems are identified through citizen and City of New Berlin representative reports of nuisance ponding or property damage. Reports resulted primarily from incidents stemming from rainfalls on June 20 through 21, 1997; July 2, 1997; and August 6, 1998. However, several of the reported problems were well known prior to these storms. Generally, the reported problems fall into one of the following categories:

- Basement flooding - ranging from a few inches to several feet in depth.
- Yard flooding - by either ponded or moving water.
- Street flooding - due to overtopping at cross-drainage structures or ponding over storm inlets.
- Streambank and drainage way erosion.

The problem locations identified by residents and City of New Berlin Representatives are shown on Plate 1 in Appendix A. Table 7-1 presents a summary of the reported problems.

While these might all be problems worth solving, the cause of a particular problem may be such that the problem cannot be solved through storm water management improvements. Examples of problems for which solutions are beyond the scope of a storm water management plan include:

- Basement flooding caused by sump pump failure due to interruption of electrical service or inadequate sump pump capacity.
- Basement flooding is caused by sanitary sewer backup. This is either a sanitary sewer collection system maintenance problem or the result of illegal connections of sump pumps or storm water drains to the sanitary sewer.
- Street flooding during heavy rainfalls. Storm sewers and roadside ditches typically are designed to convey the 10-year storm. Rainfalls in excess of the 10-year volume will cause street and yard flooding up to six inches deep.
- Flood threats on structures or other improvements that have been constructed within the 100-year floodplain that has been delineated according to the FEMA flood insurance study procedures.

Table 7-1: Flood Control and Drainage Problems Reported by City of New Berlin Residents and Representatives

Subwatershed	Subbasin	Section	Map ID*	Problem Description	System	Likely Cause
Underwood Creek	1A010	1	B,N,BB	Overflow of box culvert entrance at 124th and Meadow Lane floods basements and back yards	Primary	Clogging of trash rack at culvert inlet and inlet grates along culvert
Underwood Creek	1A010	1	J	Flooded Basement at 1517 S. 124th Street	Primary	Inadequate clogged or surcharged inlets to enclosed channel
Underwood Creek	1A020	1	Z	Home in floodplain upstream of Elm Grove Road	Primary	Home located within Floodplain
Underwood Creek	1A032	1	AA	Overtopping of Arcadian Drive and Elm Grove Road	Primary	Inadequate culvert capacity
Upper Root River	2E060	25	G,U	House flooding upstream of Grange Road	Primary	Road grade higher than low water entry elevation of house. Backup from culvert floods house
Upper Root River	2B010	12	C	Road flooding on Lagoon Road north of Cleveland Avenue	Primary	Inadequate culvert capacity or obstructed by debris
Upper Root River	2B010	12	R	Washout of private bridge at 128th and Cleveland	Primary	Property straddles major tributary of Root River. Property is surrounded by 100-year floodplain.
Upper Root River	2A020	1	L	Yard flooding and erosion in back yards on north side of Park Avenue	Primary	Inadequate culvert capacity under downstream culvert
Deer Creek	3A010	3	M	Not Stated	Primary	Culvert under 164th north of 1545 164th is too small
Deer Creek	3A010	3	CC	Inadequate drainage of backyard at 1534 South 168th causing yard flooding	Primary	No drainage path
Calhoun Creek	4C010	22	H,DD	Yard or common area? Flooding at outlet of 60-inch storm sewer	Minor	Inadequate positive drainage toward main channel. Possible siltation problem
Calhoun Creek	4A010	22	T	Unspecified flooding problem on Mary Ross, Homestead and Selentine	Minor	Not determined
Poplar Creek	6A041	15	P	Yard flooding, driveway culverts washed out	Minor	Ditch capacity inadequate to handle large upstream tributary area
Poplar Creek	6A041	15	S	Erosion Problems on Poplar Creek Tributary	Minor	Cutting of stream banks
Upper Root River	2A020	1	F	Flooding of one house and several yards east of the intersection of Elm Grove and Honey Lane	Minor	Inadequate flow path toward main channel
Upper Root River	2A020	1	K	Yard flooding at 12913 Honey Lane	Minor	Inadequate driveway culvert
Upper Root River	2A050	2	A,W	Road flooding on Koestner Lane creates access problems and yard flooding	Minor	Inadequate flow path toward railroad
Underwood Creek	1A031	2	E	Basement and yard flooding at 1600 Sherwood Drive	Minor	Cemetery drainage flows through yards to reach street
Underwood Creek	1A010	1	Q	Yard flooding with possible ditch overflow to basement at 124th and Prospect	Minor	Yard is in former drainageway
Underwood Creek	1A010	1	D	Flooding southwest of the intersection of Elm Grove and Meadow Lane	Minor	Unclear
Underwood Creek	1A032	1	O	Road overtopping near 13075 Prospect Place	Minor	Insufficient Drainage
Upper Root River	2B030	11	FF	Yard flooding at 14520 Brian Drive	Minor	Insufficient Drainage

- Flood threat on structures and other improvements during rainfall in excess of the 100-year events.

This plan examines options for solving specific residential and street flooding problems that are caused by inadequate capacity of the Primary Storm Water Management System (PSMS) and erosion problems in PSMS channels. The plan also presents solutions for serious capacity deficiencies in the minor drainage system. The PSMS is defined as the system of ponds, open channels, overflows, and roadway crossing structures designed to convey floodwaters. The PSMS is usually designed to handle the 1 percent recurrence interval, or 100-year event without damage or threat to public safety. The minor system is designed to carry flows resulting from frequent or "Aeveryday" rainfalls without disruption. The minor system consists of storm sewers, street inlets, roadside ditches, and driveway culverts. These minor system facilities are usually designed to convey the 10-year storm flow. Therefore, significant ponding and street flow should be expected in storms greater than the 10-year recurrence interval storm event.

In order to evaluate the flooding problems, a priority system was developed to differentiate varying degrees of problem severity. Priorities are based upon two factors: the cost-effectiveness of the project and whether storm water management improvements can adequately solve the problem. Primary problems encompass both factors. Minor problems meet either one or none of the priority factors. Recommended solutions are developed only for the primary problems.

7.2.1 Primary Flooding Problems

Seven primary problems were identified from the reported problems of the City of New Berlin. Each problem is associated with one or more map identification letters which represent specific citizen reports. This form of identification is based upon the time the problem was reported to the City of New Berlin. The map identification was used to mark the problem location on Plate 1 in Appendix A. The location and the type of flooding problem for each primary flooding problem is discussed below.

7.2.1.1 Problem Area UNDERWOOD1 - Underwood Creek at Meadow Lane (Map ID - A, B, J, N, BB)

Along Meadow Lane between 128th and 124th Street, the South Branch of Underwood Creek is enclosed in a rectangular storm sewer that is initially nine-feet wide by four-feet high, and is ultimately 14 feet wide where it discharges into the Greenfield Park Golf Course, east of 124th Street. There are numerous reports of house, yard, and street flooding associated with this enclosed channel.

7.2.1.2 Problem Area UNDERWOOD2

Problem Area UNDERWOOD 2a - Underwood Creek near Elm Grove Road (Map ID - D, Z, AA)

This problem involves overbank flooding of yards and homes along a reach of the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. The primary cause of the problem is that the properties are in or very close to the 100-year floodplain.

Problem Area UNDERWOOD 2b - Gatewood Park (Map ID - E,X)

This residential area consists of six streets east of Sunny Slope Road and South of Greenfield Avenue. Residents experience extensive yard and basement flooding due to slow drainage of the neighborhood and adjacent cemetery. The cause of the problem is mild roadside ditch slopes and inadequate outlet capacity under Sunny Slope Road.

7.2.1.3 Problem Area ROOT1 - Upper Root River - 130th Block of Park Avenue (Map ID - L)

One residence experiences flooding along Park Avenue due to inadequately sized downstream culvert at Graham Street. Also, inadequate drainage ditch capacity exists between Elm Grove Road and Honey Lane south to the golf course.

7.2.1.4 Problem Area ROOT2 - Upper Root River - 132nd Street to Lagoon Road Along Cleveland Avenue (Map ID - C, R)

Approximately 15 homes are within the floodplain in the area bounded by Cleveland Avenue, National Avenue, 124th Street, and 132nd Street. The inlet and outlet configuration of the culverts are not parallel to the stream at the eastern Lagoon Road culverts at Cleveland Avenue. Road flooding occurs on Lagoon Road north of Cleveland Avenue. A private bridge at 128th Street and Cleveland Ave. has been washed out.

7.2.1.5 Problem Area ROOT3 Upper Root River - LaSalle Drive and Grange Avenue (Map ID - G, U)

A structure located adjacent to a tributary of the Upper Root River near Grange Avenue experiences flooding. Although a citizen report indicates a problem at Grange Avenue, the problem is caused by inadequate culvert capacity downstream at St. Mary=s Drive.

7.2.1.6 Problem Area ROOT4 - Upper Root River - Honey Lane (Map ID - F, K)

Yard flooding and erosion are experienced by several residences along a tributary to the Upper Root River and also drainage problems along the railroad tracks north of Honey Lane near Elm Grove Road. The problem is due to inadequate drainage capacity and culvert capacity.

7.2.1.7 Problem Area DEER1 - Deer Creek - Buena Park (Map ID - M, CC)

Six residences experience structural flooding. Several additional residences experience yard and basement flooding. The problem stems from backup from inadequate culverts, ditch capacity, and lot grading. The general area slope is very flat. In addition, most homes have sump pump discharge into the ditch. Lawn clippings and yard waste contribute to culvert blockages.

7.2.2 Minor System Flooding Problems

Storm Water flooding problems identified as resulting from deficiencies in the minor storm water drainage system are listed below. The New Berlin Storm Water Management Master Plan does not provide conceptual engineering solutions to minor system problems. Further study of these problem areas may be warranted based on City of New Berlin staff recommendations. It may not be cost effective to solve minor system problems based on the current level of damages.

- Deer Creek:

- <Inadequate local drainage in backyards between 164th and 168th Street and Roosevelt Avenue

- Underwood Creek:

- <Insufficient drainage from Highland Memorial Park
 - <Lack of storm water conveyance at Gatewood Drive and Clover Knoll Place
 - <Inadequate culvert capacity at Kostner Lane and C. & N.W. Railroad
 - <Sediment and debris blockage of Sunny Slope Road culvert
 - <Surcharging manhole at 13000 block of Greenfield Avenue
 - <Insufficient ditch storage at 124th Street and Prospect Drive

- Poplar Creek:

- <Minor erosion on Poplar Creek between Calhoun Road and Victor Road
 - <Drainage easement backup at 157th Street and Monterey Drive
 - <Insufficient ditch storage at 158th Street and Santa Rosa Boulevard
 - <Sediment and debris blockage at Calhoun Road and Salentine Drive

- Calhoun Creek:

- <Sediment and debris blockage at Sovereign Drive

- Upper Root River:

- <Parkwood Lane storm sewer capacity

7.3 Culvert Capacity Problems

The hydrologic and hydraulic computer modeling analysis, described in Section 5, included a capacity analysis of approximately 73 road crossing culverts in the primary system in the City of New Berlin. The SWMM representation simulated road crossing culverts which incorporate energy losses in the culvert barrel(s) as well as the culvert entrance and departure reaches. The model also accounts for backwater (ponding) behind the culverts and the possibility of road overtopping. The culverts were analyzed for the flow conditions generated by the 2-, 10-, 25-, and 100-year recurrence interval storm events. Culverts were evaluated for several potential deficiencies including insufficient flow, capacity, excessive backwater, and over road topping. The following criteria were employed in identifying primary system culvert capacity deficiencies:

- Overtopping of main arterials in the 100-year storm,
- Insufficient flow capacity for the 100-year storm, and
- Excessive backwater behind a culvert in a developed area.

The analysis results indicate that 32 of the primary culverts modeled have capacity deficiencies. Primary system culverts determined to have capacity deficiencies are presented in Table 7-2.

As part of the citywide culvert capacity analysis, described in Section 5, 715 culverts in the minor storm water management system were evaluated for capacity and level of service. Culverts in the minor or secondary storm water management system should provide at least 10-year capacity. Minor culverts determined to have capacity deficiencies are presented in Table 7-3. The analysis results indicate that approximately 83 culverts do not meet this criterion.

7.4 Drainage Ditch Problems

Drainage problems are identified through the examination of 556 ditch segments located within the New Berlin study area. Based on the inventory, ditches were evaluated based upon location, shape, and levels of erosion, sedimentation, vegetation, garbage, and standing water.

Upon field inspection, 32 locations are determined to be problem areas. Problem areas are defined as locations requiring maintenance operations for erosion, re-stabilization, clearing of sedimentation, or collection of trash deposits to ensure proper drainage. Table 7-4 presents the drainage ditch problem locations.

7.5 Streambank Problems

The streambank inventory, discussed in Section 4, classified approximately 34 miles of channel in the New Berlin study area. This inventory evaluated the channel stability

Table 7-1: Flood Control and Drainage Problems Reported by City of New Berlin Residents and Representatives

Subwatershed	Subbasin	Section	Map ID*	Problem Description	System	Likely Cause
Underwood Creek	1A010	1	B,N,BB	Overflow of box culvert entrance at 124th and Meadow Lane floods basements and back yards	Primary	Clogging of trash rack at culvert inlet and inlet grates along culvert
Underwood Creek	1A010	1	J	Flooded Basement at 1517 S. 124th Street	Primary	Inadequate clogged or surcharged inlets to enclosed channel
Underwood Creek	1A020	1	Z	Home in floodplain upstream of Elm Grove Road	Primary	Home located within Floodplain
Underwood Creek	1A032	1	AA	Overtopping of Arcadian Drive and Elm Grove Road	Primary	Inadequate culvert capacity
Upper Root River	2E060	25	G,U	House flooding upstream of Grange Road	Primary	Road grade higher than low water entry elevation of house. Backup from culvert floods house
Upper Root River	2B010	12	C	Road flooding on Lagoon Road north of Cleveland Avenue	Primary	Inadequate culvert capacity or obstructed by debris
Upper Root River	2B010	12	R	Washout of private bridge at 128th and Cleveland	Primary	Property straddles major tributary of Root River. Property is surrounded by 100-year floodplain.
Upper Root River	2A020	1	L	Yard flooding and erosion in back yards on north side of Park Avenue	Primary	Inadequate culvert capacity under downstream culvert
Deer Creek	3A010	3	M	Not Stated	Primary	Culvert under 164th north of 1545 164th is too small
Deer Creek	3A010	3	CC	Inadequate drainage of backyard at 1534 South 168th causing yard flooding	Primary	No drainage path
Calhoun Creek	4C010	22	H,DD	Yard or common area? Flooding at outlet of 60-inch storm sewer	Minor	Inadequate positive drainage toward main channel. Possible siltation problem
Calhoun Creek	4A010	22	T	Unspecified flooding problem on Mary Ross, Homestead and Selentine	Minor	Not determined
Poplar Creek	6A041	15	P	Yard flooding, driveway culverts washed out	Minor	Ditch capacity inadequate to handle large upstream tributary area
Poplar Creek	6A041	15	S	Erosion Problems on Poplar Creek Tributary	Minor	Cutting of stream banks
Upper Root River	2A020	1	F	Flooding of one house and several yards east of the intersection of Elm Grove and Honey Lane	Minor	Inadequate flow path toward main channel
Upper Root River	2A020	1	K	Yard flooding at 12913 Honey Lane	Minor	Inadequate driveway culvert
Upper Root River	2A050	2	A,W	Road flooding on Koestner Lane creates access problems and yard flooding	Minor	Inadequate flow path toward railroad
Underwood Creek	1A031	2	E	Basement and yard flooding at 1600 Sherwood Drive	Minor	Cemetery drainage flows through yards to reach street
Underwood Creek	1A010	1	Q	Yard flooding with possible ditch overflow to basement at 124th and Prospect	Minor	Yard is in former drainageway
Underwood Creek	1A010	1	D	Flooding southwest of the intersection of Elm Grove and Meadow Lane	Minor	Unclear
Underwood Creek	1A032	1	O	Road overtopping near 13075 Prospect Place	Minor	Insufficient Drainage
Upper Root River	2B030	11	FF	Yard flooding at 14520 Brian Drive	Minor	Insufficient Drainage

Table 7-2: Culvert Capacity Analysis Results - Undersized Primary System Culverts

Street Name	Subwatershed	Culvert ID#	Capacity (cfs)	Future Conditon Flow (cfs)				Level of Protection	
				2yr	10yr	25yr	100yr	Flow Capacity	Road Overtopping*
124th Street	Root	24.04.08/09	180	251	318	434	695	<2 year	2 year
132nd Street		12.03.16/17	242	130	210	262	413	<25 year	25 year
133rd Street		12.03.13/14	242	130	214	266	414	<25 year	25 year
Dakota Street		12.03.08	14	24	34	45	68	<2 year	100 year
128th Street South		12.04.05	121	83	110	127	164	<25 year	25 year
130th Street		12.04.03	121	93	132	195	266	<10 year	25 year
National Avenue		12.04.03	211	118	157	217	338	<25 year	2 year
124th Street		12.04.07	187	87	121	160	287	<100 year	25 year
Coldspring Road		24.01.16	21	9	13	17	29	<100 year	100 year
Balboa Drive		25.04.08/09	118	82	118	154	251	< 25 year	25 year
Cherrytree Lane		25.01.19/20	218	84	118	156	277	<100 year	25 year
Radisson Court		25.01.12/13	210	94	138	170	275	<100 year	25 year
Frances Street		36.01.05	36	15	27	31	87	< 100 year	10 year
Beres Road	Calhoun	28.04.15/14/13	444	148	297	461	825	<25 year	<2 year
Calhoun Road		27.01.01/02	284	184	274	426	729	<25 year	2 year
Rock Freeway (I-43)		27.04.06/07	224	153	254	336	488	<10 year	25 year
Martin Road		33.03.05/02.05	118	59	90	120	197	<25 year	10 year
Greenfield Avenue	Deer	03.01.16	1069	587	885	1060	1341	<100 year	100 year
C & NW Railroad		03.01.11/12	980	562	840	1006	1250	<25 year	100 year
Lincoln Avenue		03.04.05	527	397	617	744	1100	<10 year	10 year
Cleveland Avenue		10.03.01/02/03	999	750	1242	1530	2016	<10 year	100 year
James Drive		10.04.02/03/04	1128	600	1008	1269	1737	<25 year	100 year
National Avenue		14.02.06	366	185	313	398	547	<25 year	100 year
Cleveland Avenue	Poplar	09.04.01/02	324	230	368	422	502	<10 year	100 year
Coffee Road		16.01.01/02/03	804	234	396	630	1179	<100 year	100 year
Observatory Road		21.01.01	105	157	239	302	357	<2 year	100 year
Cleveland Avenue		08.03.09/10	108	94	111	119	136	<10 year	< 2 year
Willow Road		16.02.04	33	33	40	45	53	2 year	< 2 year
Gravel Road		05.03.09	15	6	8	14	27	<100 year	25 year
Lincoln Avenue		06.04.05	14	6	9	25	29	<25 year	10 year
Arcadian Drive	Underwood	01.02.10	177	127	174	206	272	<25 year	50 year
Elm Grove Road		01.01.12	138	136	200	245	337	<10 year	2 year

* Road overtopping can occur even though the flow capacity is not exceeded when there is backwater from downstream.

Table 7 - 3: Culvert Capacity Analysis Results- Undersized Minor System Culverts

CULVERT ID	Location	Size (inches)	Shape & Material	Length (feet)	Upstream Invert (feet)	Downstream Invert (feet)	Slope (ft/ft)	Capacity (cfs)	100 yr Flow (cfs)	10 yr Flow (cfs)	10 yr Shortfall Shortfall (cfs)	Percent Short
21.01.02	OBSERVATORY & WOELFEL	21X30	ARCP	120	898.62	898.42	0.0017	19	308	166	147	89%
15.03.01	CALHOUN	30	CMP	57	869.22	868.97	0.0044	37	504	252	215	85%
06.01.20	C&NW RR	24	RCP	53	827.35	826.97	0.0072	21	292	144	123	85%
04.01.13	C & NW RR	18X24	CMPA	36	838.98	836.05	0.0814	13	117	58	45	78%
25.01.23	COURTLAND PARKWAY	18X24	ACMP	56	854.71	852.53	0.0389	14	155	53	39	73%
01.02.04	GREENFIELD & 124th	24	RCP	53	759.76	758.51	0.0236	21	177	79	58	73%
16.01.11	CALHOUN S. OF COFFEE	30	CMP	57	869.22	868.97	0.0044	37	274	122	85	69%
27.03.09	BELOIT	48	RCP	175	866.70	864.00	0.0154	121	691	396	275	69%
106.03.10	NATIONAL & CROWBAR	24	CMP	70	956.59	955.61	0.0140	21	124	67	46	68%
28.02.13	BELOIT & TRIBUTARY	30X42	ACMP	40	843.05	842.71	0.0085	48	226	140	92	66%
08.03.07	CLEVELAND & JOHNSON	24	CMP	65	852.05	850.97	0.0166	21	135	62	40	65%
29.02.02	LAWNSDALE	24	CCP	41	888.58	888.55	0.0007	21	133	60	39	65%
25.04.29	124TH & JOLIET	18X27	ACMP	43	815.02	814.58	0.0102	16	107	44	29	65%
25.02.02	RADISSON & MENARD	18X27	ACMP	45	882.80	880.96	0.0409	14	116	40	25	64%
13.03.19	CRAWFORD & WILBUR	24	CMP	71	818.90	818.21	0.0097	21	173	59	38	64%
01.02.25	NEEDHAM & 124th	27	RCP	95	752.35	748.67	0.0387	29	177	79	50	64%
32.01.12	RACINE & JULIUS	24	RCP	70	862.00	861.49	0.0073	21	103	58	37	63%
04.04.01	GREENFIELD	24	CMP	45	838.79	832.58	0.1380	21	126	57	36	63%
32.04.05	GLENWOOD & TIMBERLANE	21X27	ACMP	40	837.39	836.94	0.0112	20	68	53	33	62%
32.01.08	TERRACE & TIMBERLANE	21X27	ACMP	40	848.64	847.30	0.0335	20	68	53	33	62%
06.01.19	C&NW RR	48	CONC	34	827.13	827.01	0.0035	55	292	144	89	62%
27.04.08	I-43 & MOORLAND	24	RCP	60	873.33	872.75	0.0097	21	94	54	33	60%
11.02.16	LINCOLN & BROOKSIDE	24	CMP	60	863.49	863.00	0.0082	21	104	52	31	59%
27.03.08	BELOIT	18X24	ACMP	49	872.80	872.50	0.0061	14	58	33	19	57%
28.03.10	MARTIN & EGOFSKE	24	CMP	62	852.33	847.78	0.0734	21	84	49	28	56%
21.01.01	OBSERVATORY & WOELFEL	36X72	ACMP	42	885.25	884.91	0.0081	105	343	239	134	56%
16.03.01	COFFEE & WOELFEL	18X24	ACMP	47	872.42	872.25	0.0036	14	68	31	16	54%
01.02.14	PROSPECT & 124th	30	CMP	30	760.57	760.57	0.0000	37	177	79	42	53%
01.02.27	PROSPECT PLACE & MILTON	17X42	ACMP	35	813.37	810.33	0.0869	21	97	44	23	52%
25.02.20	I-43 ROCK FREEWAY	30	CMP	443	868.21	861.23	0.0158	37	190	76	39	51%
27.04.09	I-43 & MOORLAND	24	RCP	24	869.33	869.05	0.0117	21	75	43	22	51%
25.04.12	MARQUETTE AND MAGELLAN	24	CMP	40	842.88	842.22	0.0165	21	146	43	21	50%
01.01.04	PROSPECT & CONRAD	24	CMP	43	770.92	771.75	-0.0193	10	44	20	10	48%
105.02.04	RACINE DRIVE (AVENUE)	72	CMP	131	829.14	829.03	0.0008	333	1078	637	304	48%
02.04.26	LINCOLN & MEADOWMERE	18X30	ACMP	46	842.71	842.05	0.0143	19	87	35	16	47%
07.02.02	AMOR & CLEVELAND	30	CMP	81	855.78	854.64	0.0141	17	79	32	15	47%
11.02.01	CLEVELAND & PARKWAY	30	CMP	96	870.76	870.36	0.0042	37	139	69	32	46%
01.02.09	PROSPECT & ELM GROVE	24	CMP	40	807.62	807.09	0.0132	21	88	40	18	46%
01.01.11	GREENFIELD & ELM GROVE	24	CMP	53	765.72	764.41	0.0248	21	88	40	18	46%
12.04.05	MONTANA & S.128TH	48	RCP	55	759.45	758.84	0.0111	121	421	217	96	44%
05.03.05	BTWN LINCOLN & C&NW RR	48	RCP	33	827.36	827.13	0.0070	121	438	216	95	44%
01.04.03	GRAHAM & TRIB	15X27	ACMP	51	774.45	774.08	0.0073	13	66	23	10	43%
29.01.06	EGOFSKE & OVERLOOK	27	RCP	40	898.87	897.00	0.0468	29	77	49	20	41%
15.04.05	ST. FRANCIS & TOP-O-HILL	18X30	ACMP	43	904.80	904.38	0.0098	19	63	32	13	41%

Table 7 - 3: Culvert Capacity Analysis Results- Undersized Minor System Culverts

CULVERT ID	Location	Size (inches)	Shape & Material	Length (feet)	Upstream Invert (feet)	Downstream Invert (feet)	Slope (ft/ft)	Capacity (cfs)	100 yr Flow (cfs)	10 yr Flow (cfs)	10 yr Shortfall Shortfall (cfs)	Percent Short
03.02.42	ROOSEVELT & S. 167th	24X36	ACMP	43	837.80	837.26	0.0126	33	117	57	23	41%
32.01.11	RACINE & JULIUS	24	RCP	66	863.25	862.43	0.0124	21	62	35	13	39%
10.02.10	S. 170th & LINCOLN	24	ACMP	54	846.51	845.71	0.0148	21	62	35	13	38%
24.04.13	BELOIT & FREEWAY	24	CMP	106	869.79	869.34	0.0042	19	76	30	11	37%
16.02.05	THORNAPPLE	20X28	ACMP	45	895.78	895.76	0.0004	17	58	26	9	35%
26.02.08	MOORLAND & I-43	24	RCP	184	862.49	861.63	0.0047	21	56	32	11	34%
27.04.05	ROCK I-43	24	RCP	84	893.48	893.10	0.0045	21	56	32	11	34%
32.01.04	TIMBERLANE & VISTA	18X24	ACMP	45	864.32	864.03	0.0064	14	31	21	7	33%
15.02.08	VICTOR & CALHOUN	3 @ 60"	CMP	60	856.28	855.88	0.0067	633	1890	945	312	33%
22.03.03	SALENTINE & CALDWELL	18X30	ACMP	47	851.24	850.87	0.0079	19	46	28	9	33%
24.04.05	ARMOUR & NORMAN	21	CMP	57	866.13	865.92	0.0037	15	57	23	7	33%
25.01.32	LANGLADE & CTH I	24X36	ACMP	43	858.33	858.24	0.0021	33	138	50	16	33%
15.04.07	ST. FRANCIS	24	CMP	37	903.66	902.66	0.0270	21	63	32	10	32%
11.02.04	PARKWAY	36	RCP	68	864.40	864.10	0.0044	59	174	87	28	32%
01.02.20	BERLIN	21	RCP	110	823.78	823.67	0.0010	15	49	22	7	31%
18.03.05	RACINE & ORCHARD	24	CMP	44	946.19	945.98	0.0048	21	65	30	9	29%
03.02.30	ADDISON & 168th	18X27	ACMP	238	850.33	846.69	0.0153	19	52	25	7	27%
36.04.01	JANESVILLE	24	CMP	82	809.78	809.27	0.0062	21	75	28	7	25%
25.03.18	MENARD & GUERIN	21X27	ACMP	51	876.52	875.88	0.0125	20	78	26	6	24%
04.02.12	CALHOUN	24X36	ACMP	37	865.41	865.07	0.0092	33	88	43	10	23%
28.03.08	BERES & MARTIN	20X30	ACMP	20	837.50	837.07	0.0215	20	44	25	5	21%
18.03.08	WOODLAND	36X48	CMP	40	937.67	937.13	0.0135	80	217	101	21	21%
11.04.20	CLEVELAND & SUNNYSLOPE	18X30	ACMP	62	839.23	838.40	0.0134	19	58	23	5	20%
02.04.13	WOODLAND	24X36	ACMP	46	847.12	847.02	0.0022	33	102	41	7	18%
10.04.01	RYERSON & 30' UTILITY EASEMENT	42X54	ACMP	79	852.99	851.82	0.0148	104	250	125	21	17%
03.01.15	C&NW RR & TRIB	36X58	ACMP	42	836.85	836.77	0.0019	105	260	126	21	17%
28.04.05	SATURN	21X27	ACMP	41	863.42	862.83	0.0144	20	35	24	4	17%
02.04.28	LINCOLN & BROOKLAND	24X32	ACMP	57	848.42	845.87	0.0447	29	87	35	6	16%
10.04.05	160th 20' DRAINAGE EASEMENT	24	CMP	9	860.09	860.02	0.0078	21	50	25	4	14%
25.03.06	ANDRAE & GRANGE	27X42	ACMP	38	858.82	857.98	0.0221	46	155	53	7	14%
15.04.06	ST. FRANCIS & 159th	18X30	ACMP	49	905.76	905.27	0.0100	19	42	21	2	12%
15.01.03	RIVIERA & MONTERREY	18X30	ACMP	40	874.83	874.44	0.0097	19	42	21	2	12%
11.03.02	CLEVELAND & 152nd	24	CMP	35	886.36	885.40	0.0274	21	46	24	3	12%
11.03.06	CLEVELAND & 149th	24	CMP	53	874.83	874.42	0.0077	21	46	24	3	12%
12.03.08	DAKOTA & MONTANA	15X30	ACMP	44	794.07	792.96	0.0252	14	54	16	2	11%
03.03.08	LINCOLN AVE UTILITY & RR & DRAINAGE	30X42	ACMP	33	842.94	842.66	0.0085	54	122	61	7	11%
28.03.09	EGOFSKE & BERES	24X36	ACMP	86	837.84	836.46	0.0160	33	65	37	4	10%
36.01.06	FRANCES & ST. MARY'S	2 @ 36x132	CONC	41	805.20	805.03	0.0041	498	1476	554	56	10%
15.01.06	SANTA ROSA BLVD	32X48	ACMP	38	880.59	880.50	0.0024	76	168	84	8	10%

Table 7-4: Summary of Drainage Ditch Problem Areas

Subwatershed	Section	Location	Depth	Width	Shape	Identified Problem
Calhoun Creek	26	North side of Beloit Road, west of Small Road	2'-5'	5'-10'	U	Bottom erosion, trash accumulation
Deer Creek	2	South side of Rogers Drive, east of Valley Spring Court	1'-2'	5'-10'	V - U	Bottom Erosion
Deer Creek	2	North side of Gatewood Drive, east of Woodside Drive	1'-2'	5'-10'	V	Bottom erosion, sedimentation, standing water
Deer Creek	3	South side of Rogers Drive, west of Deer Creek	2'-5'	5'-10'	flat	Bottom and side erosion, sedimentation, trash accumulation, standing water
Deer Creek	3	South Side of Greenfield Avenue, between Calhoun and Moorland Roads	2'-5'	5'-10'	V - U	Bottom erosion, trash accumulation
Deer Creek	2	South side of Greenfield Avenue, east of Moorland Road	2'-5'	5'-10'	U	Bottom erosion, trash accumulation
Deer Creek	3	North and east side of Carriage Lane, south of Greenfield Ave. west of Coach Light	2'-5'	5'-10'	flat to U	Bottom erosion
Deer Creek	9	West side of Calhoun Road, south of Lincoln Avenue	2'-5'	5'-10'	V - U	Bottom and side erosion, sparse/dry vegetation
Deer Creek	15	North side of El Dorando Drive, west of Moorland Road	2'-5'	5'-10'	flat to U	Bottom erosion
Deer Creek	10	East side of 162nd Street, north of Glendale Drive	2'-5'	5'-10'	flat to V	Bottom and side erosion, sedimentation, trash accumulation
Deer Creek	10	East side of 170th Street, north of Glendale Drive	2'-5'	5'-10'	flat to V	Bottom and side erosion, sedimentation, trash accumulation, standing water
Deer Creek	11	South side of Cleveland Avenue, between 149th and 152nd Street	2'-5'	5'-10'	V - U	Bottom erosion and trash accumulation
Deer Creek	10	South side of Lincoln Avenue, east of 170th Street	2'-5'	5'-10'	V - U	Bottom erosion
Poplar Creek	11	South side of Graylog Lane, east of Ranke Lane	1'-2'	5'-10'	V - U	Bottom erosion
Poplar Creek	16	North side of Coffee Road, west of Calhoun Road	2'-5'	5'-10'	V - U	Bottom and side erosion, sedimentation, trash accumulation, sparse vegetation
Poplar Creek	4	South side of Greenfield Avenue, east of Ridgeway Road	1'-2'	5'-10'	V	Bottom erosion, standing water

Table 7-4: Summary of Drainage Ditch Problem Areas

Subwatershed	Section	Location	Depth	Width	Shape	Identified Problem
Poplar Creek		East side of Calhoun Road, north of Observation Road	2'-5'	5'-10'	flat to V	Bottom erosion
Poplar Creek	14	West side of Spruce Road at Crimson Lane	2'-5'	5'-10'		to be determined
Poplar Creek	16,21	Woelfel Road, south of Coffee Road	2'-5'	5'-10'	V	Bottom and side erosion, sedimentation
Tess Corners Creek	25,26	East side of Sunny Slope Road, north and south of Grange Avenue	2'-5'	5'-10'		Area is under construction, erosion
Underwood Creek	1	West side of Sunny Slope Road, south of Gatewood Drive	2'-5'	5'-10'	U	Bottom erosion, sedimentation, standing water, trash accumulation
Underwood Creek	2	South side of Greenfield Avenue, at Woodside Drive	2'-5'	5'-10'	V	Bottom and side erosion, standing water
Underwood Creek	1	South side of Greenfield Avenue, east of Parkview Avenue	2'-5'	5'-10'	U	Bottom erosion, trash accumulation
Upper Root River	1	West side of Old Oak Lane at Park Avenue	2'-5'	5'-10'	V - U	Bottom and side erosion, standing water
Upper Root River	12	South Side of Cardinal Parkway at Sunny Slope Road	2'-5'	5'-10'	V - U	Bottom erosion, sedimentation, standing water
Upper Root River	14	East side of Glen Park Road, North of Butternut	2'-5'	5'-10'		to be determined
Upper Root River	13	West side of 124th Street, north of Wilbur Drive	2'-5'	5'-10'	flat to V	Bottom erosion, sedimentation
Upper Root River	13	North side of Howard Avenue, east of Sunny Ridge	2'-5'	5'-10'	flat to V	Bottom and side erosion, trash accumulation
Upper Root River	2	South side of Park Avenue, west of Sunny Slope Road	1'-2'	5'-10'	V - U	Bottom Erosion
Upper Root River	1	South side of Honey Lane, east of Sunny Slope Road	1'-2'	5'-10'	V - U	Bottom Erosion
Upper Root	1	West side of 124th Street, south of Graham Street	2'-5'	5'-10'	V	Bottom and side erosion, sedimentation, sparse and uprooted vegetation, trash accumulation
Upper Root River	24	North side of Beloit Road, east of Armor Avenue	2'-5'	5'-10'	flat to U	Bottom erosion, trash accumulation

Table 7-5: Summary of Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.2 mile east of New Berlin Hills Golf Course property line northeast 0.1 mile	Poor	Poor landform slope cutting; fair mass wasting, debris jam potential, and vegetative bank protection
Upper Root River - C Designation	0.1	Tributary to Root River from pond north 0.1 mile to point extending south of Dakota St. and east of 134th St.	Poor	Poor landform slope and vegetative bank protection; fair mass wasting, debris jam potential, obstructions, cutting, and deposition
Upper Root River-A Designation	0.1	Tributary to Root River from point 0.1 mile west of New Berlin Hills Golf Course property line east to New Berlin Hills Golf Course property line	Fair	Fair landform slope, debris jam potential, vegetative bank protection, obstructions, cutting, and deposition
Tess Corners Creek - A Designation	0.1	Tributary to Root River from College Ave. north 0.1 mile	Fair	Poor debris jam potential, vegetative bank protection, and obstructions; fair cutting
Upper Root River - B Designation	0.1	Tributary to Root River from point 0.4 mile east of Sunny Slope Rd. southeast 0.1 mile	Fair	Poor landform slope; fair cutting and deposition
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.3 mile east of New Berlin Hills Golf Course property line north 0.1 mile	Fair	Poor landform slope; fair mass wasting, debris jam potential, and vegetative bank protection
Poplar Creek	0.8	From Cleveland Ave. south to corner of Calhoun Rd. and Victor Rd.	Fair	Poor obstructions; poor/fair debris jam potential and vegetative bank protection; fair channel capacity, cutting, and deposition
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.1 mile east of New Berlin Hills Golf Course property line east 0.1 mile	Fair	Poor mass wasting; fair landform slope and debris jam potential
Tess Corners Creek - A Designation	0.1	Tributary to Root River between Grange Ave. and College Ave.	Fair	Fair vegetative bank protection, cutting, and deposition
Calhoun Creek - B Designation	0.2	Tributary to Calhoun Creek from point 0.2 mile south of Beloit Rd. southwest 0.2 mile to pond in Calhoun Park	Fair	Fair debris jam potential, obstructions, cutting, and deposition
Underwood Creek - A Designation	1.0	Tributary to Underwood Creek from corner of Meadow Ln. and Sunny Slope Rd. east to storm sewer under Meadow Ln.	Fair	Poor/fair cutting; fair landform slope, debris jam potential, vegetative bank protection, and deposition
Upper Root River - D Designation	0.1	Tributary to Root River from point extending southwest of Manitoba Ave. north 0.1 mile	Fair	Fair landform slope, mass wasting, vegetative bank protection, and cutting
Upper Root River - G Designation	0.1	Tributary to Root River from point extending northeast of White Ct. southeast 0.1 mile to corner of Howard Ave. and 128th St.	Fair	Fair debris jam potential, vegetative bank protection, and cutting

Table 7-5: Summary of Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern
Upper Root River - C Designation	0.2	Tributary to Root River from point extending south of Dakota St. and east of 134th St. northeast to 133rd St.	Fair	Poor vegetative bank protection; poor/fair landform slope and cutting; fair mass wasting
Poplar Creek - F Designation	0.6	Tributary to Poplar Creek from Cleveland Ave. northwest to junction with Poplar Creek	Fair	Poor/fair debris jam potential; fair landform slope, vegetative bank protection, obstructions, and cutting
Deer Creek	0.2	From point south of 162nd St. east 0.6 mile to point between Glendale Dr. and Cleveland Ave.	Fair	Fair landform slope, mass wasting, cutting, and deposition
URR-A Designation	0.3	Tributary to Root River from point 0.2 mile west of 124th St. in New Berlin Hills Golf Course east 0.3 mile	Fair	Fair landform slope, debris jam potential, obstructions, and deposition
Deer Creek Designation	0.1	From Cleveland Ave. south 0.1 mile	Fair	Poor landform slope; fair debris jam potential and obstructions
URR-A Designation	0.2	Tributary to Root River from Meadowlark Dr. east to point 0.1 mile west of New Berlin Hills Golf Course	Fair	Fair debris jam potential, vegetative bank protection, cutting, and deposition
URR-D Designation	0.5	Tributary to Root River from point extending west of Ohio Dr. east to Highpointe Dr.	Fair	Fair obstructions, cutting, and deposition
Poplar Creek Designation	1.3	From junction with tributary UF-E southeast 1.3 miles	Fair	Fair debris jam potential, vegetative bank protection, cutting, and deposition
CC-B Designation	0.5	Tributary to Calhoun Creek from I-43 south to Westridge Dr.	Fair	Fair debris jam potential and vegetative bank protection
Deer Creek Designation	0.6	From National Ave. northwest 0.6 mile	Fair	Poor obstructions; fair landform slope, debris jam potential, cutting, and deposition
Deer Creek Designation	0.2	From junction with tributary DC-C north 0.2 mile	Fair	Poor obstructions; fair landform slope and cutting
CC-B Designation	0.7	Tributary to Calhoun Creek from I-43 northwest 0.7 mile	Fair	Fair debris jam potential, vegetative bank protection, obstructions, and deposition
CC-C Designation	0.3	Tributary to Calhoun Creek from I-43 north to point extending east of Dale Dr.	Fair	Fair landform slope and debris jam potential

Table 7-5: Summary of Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern
UF-A Designation	1.4	Tributary to Poplar Creek from Cleveland Ave. north 1.4 miles	Fair	Poor vegetative bank protection; fair landform slope, debris jam potential, obstructions, cutting, and deposition
Poplar Creek Designation	0.1	From Calhoun Rd. west 0.1 mile	Fair	Fair landform slope and cutting
CC-B Designation	0.1	Tributary to Calhoun Creek from Beloit Rd. northeast 0.1 mile	Fair	Fair debris jam potential and vegetative bank protection
CC-H Designation	0.4	Tributary to Calhoun Creek from Linnie Lac southwest 0.4 mile to point extending north of College Ave.	Fair	Fair vegetative bank protection and obstructions
URR-B Designation	0.3	Tributary to Root River from point extending north of Tammy Ln. east 0.3 mile to point 0.1 mile east of Sunny Slope Rd.	Fair	Fair vegetative bank protection and deposition
Poplar Creek Designation	0.7	From junction with tributary UF-L northeast 0.7 mile	Fair	Poor debris jam potential; fair obstructions and cutting
URR-D Designation	0.1	Tributary to Root River from beginning near Long Acre Dr. east 0.1 mile	Fair	Fair deposition
URR-E Designation	0.2	Tributary to Root River from 132nd St. east 0.2 mile	Fair	Fair landform slope, vegetative bank protection, and cutting
CC-A Designation	1.0	Tributary to Calhoun Creek from junction with CC-B and CC-C north 1.0 mile	Fair	Fair landform slope, debris jam potential, and vegetative bank protection
CC-C Designation	0.2	Tributary to Calhoun Creek from Bener Rd. southwest 0.2 mile	Fair	Fair landorm slope
CC-G Designation	0.1	Tributary to Calhoun Creek from junction with CC-H northwest to I-43	Fair	Fair vegetative bank protection
UF-F Designation	0.2	Tributary to Poplar Creek from Willow Rd. northwest to New Berlin West High School	Fair	Fair debris jam potential and vegetative bank protection
UF-H Designation	0.2	Tributary to Poplar Creek from junction with UF-L east 0.2 mile	Fair	Fair vegetative bank protection

Table 7-5: Summary of Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern
URR-F Designation	0.2	Tributary to Root River from Cleveland Rd. north 0.2 mile to beginning of concrete lining on northern wall of creek	Fair	Fair vegetative bank protection
URR-F Designation	0.1	Tributary to Root River from Cleveland Rd. southwest to 128th St.	Fair	Fair vegetative bank protection
Deer Creek Designation	0.1	From point 0.1 mile north of Glendale Rd. north 0.1 mile	Fair	Fair landform slope, cutting, and deposition
URR-D Designation	0.1	Tributary to Root River from point extending between National Ave. and Cleveland Ave. north 0.1 mile to point extending west of Montana Ave.	Fair	Fair landform slope, vegetative bank protection, obstructions, and cutting

and prioritized streambank reaches which require stabilization measures. Based on the inventory, each reach was classified as excellent, good, fair or poor. Only the streams classified as fair and poor are identified as potential problem areas that will be addressed in the Storm Water Management Master Plan for New Berlin. The streambank inventory identified about 13.4 miles of streambank which were classified as fair and 0.2 miles of streambank which were classified as poor. The streambank problem areas are described in Table 7-5 and shown on Plate 1 in Appendix A.

7.6 Water Quality Problems

The water quality analysis, described in Section 6, was conducted to estimate the amount of pollutants discharged to the major streams within New Berlin. Based on the annual pollutant loadings generated by the analysis, critical land uses, land uses which contribute a majority of the storm water pollutants, were identified.

The critical land uses are presented in Table 7-6.

Table 7-6: Critical Land Uses in New Berlin by Pollutant

Pollutant	Critical Land Use – (% of total annual load)	
	Existing Land Use Conditions	Future Land Use Conditions
Sediment	Agriculture (30%); Extractive (21%); Residential (19%)	Residential (28%); Extractive (24%); Agricultural (14%)
Phosphorous	Agricultural (47%); Residential (14%); Park (10%); Institutional (9%)	Agriculture (21%); Park (25%); Residential (22%)
Lead	Highway/Arterial (35%); Commercial (24%); Residential (20%); Industrial (16%)	Highway/Arterial (26%); Commercial (26%); Industrial (23%); Residential (21%)
Copper	Residential (37%); Highway/Arterial (18%); Commercial (15%); Industrial (15%)	Residential (40%); Industrial (21%) Commercial (16%); Highway/Arterial (14%)
Zinc	Industrial (43%); Commercial (16%); Highway/Arterial (15%)	Industrial (50%); Commercial (15%);

Based on an overall consideration of the pollutant loadings, areas which are significant contributors of pollutants within New Berlin are identified and presented on Table 7-7.

Table 7-7: Significant Storm Water Pollutant Contributor Areas

Area	Contributing Land Use	Pollutants of Concern
Critical Land Use Areas throughout the City of New Berlin	- Industrial areas - Agricultural areas - Residential - Highways and Arterials - Developing and redeveloping areas	Various
Rock Freeway	Highway	Metals
Industrial Park	Industrial Commercial	Metals
6C010 - Northwest area of Poplar Creek Subwatershed	Industrial Extractive Agricultural	Metals Phosphorous Sediment
5A020 - Southeast area of Tess Corners Creek Subwatershed	Agricultural Commercial	Sediment Phosphorous Metals
4C010 - Northern area of Calhoun Creek Subwatershed	Residential Highway Agricultural	Metals Phosphorous Sediment
7D010 & Various - Northern area of Mill Creek Subwatershed	Extractive	Sediment

The industrial analysis, described in Section 6, further evaluated the pollutant loadings from industries within New Berlin. Based on the analysis, the industries with the greatest potential for contributing significant storm water pollutant loadings are summarized in Table 7-8. Extractive industries are included in the listing based on the study area analysis.

Table 7-8: Summary of Industries Considered Potential Significant Contributors of Storm Water Pollutants

Industrial Category	Activity Areas of Concern	
Fabricated Metal Products	< Metal Preparation < Parts Cleaning < Surface Treatment < Galvanizing < Heavy Equipment Use and Storage < Equipment Maintenance < Storage of Uncoated Structural Steel	< Painting < Storing Galvanized Steel directly on the Ground < Vehicle/Equipment Traffic < Cleaning Equipment and Vehicles < Storage Areas < Equipment Usage < Above Ground Storage Tanks
Transportation Equipment	< Outdoor Material Loading / Unloading	< Outdoor Material and Equipment Storage
Land Transportation	< Vehicle and Equipment Maintenance < Outdoor Vehicle and Equipment Storage and Parking < Vehicle and Equipment Washing Areas	< Painting Areas < Liquid Storage < Cold Weather Activities < Improper Connections to Storm Sewer
Electronic, Electrical, Photographic and Optical	< Outdoor Loading / Unloading	< Outdoor Materials Storage
Printing and Publishing	< Plate Preparation < Printing < Stencil Preparation for Screen Printing	< Clean Up < Material Handling: transfer, storage, and disposal < Photo Processing
Mineral Mining and Processing (extractive)	< Site Preparation < Mineral Extraction < Mineral Processing	< Equipment and Vehicle Maintenance < Reclamation Activities

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi Sector General Permit for industrial Activities, Notice: Federal Register, September 29, 1995

Section 8

Storm Water Management Options

8.1 Introduction

Development of an effective and efficient Storm Water Management Master Plan for the City of New Berlin requires consideration of practices related to flood control and water quality protection which mitigate the storm water drainage problem areas and improve the water quality. General storm water management alternative approaches include:

- Structural and non-structural measures
- Multi-purpose regional and site specific strategies
- Opportunities to integrate features that provide both water quantity and water quality benefits

The storm water management approaches utilize storm water management measures which may include:

Wet detention basins/ponds - designed to reduce peak runoff flows and provide sedimentation. Wet ponds have a permanent pool, usually with a minimum depth of three to five feet, and an outlet structure. The permanent pool prevents re-suspension of accumulated sediments and provides conditions that enhance biochemical degradation and removal of pollutants. When properly designed, constructed, and maintained, wet detention ponds can retain a large portion of the in flowing pollutants. Wet ponds can be designed to provide either onsite detention or regional detention. Regional detention facilities provide benefits for large areas, thereby reducing the need for numerous onsite controls. A typical wet detention pond/basin is shown on Figure 8-1.

Dry detention basins - designed primarily for flood control. Dry basins impound water only during and immediately after runoff-producing storm events. Because the basins are designed to drain completely following storms, only minor sedimentation occurs, providing minimal water quality benefit. A typical dry detention basin is shown on Figure 8-2.

Extended detention basins - detain a portion of the storm water runoff for up to 24 hours or more after a storm by limiting the capacity of the outlet structure, thereby reducing peak runoff flows. Extended detention allows sedimentation to occur. The basins generally do not have a permanent pool and can be dry between storm events.

Infiltration systems - reduce storm water runoff volumes and rates and provide pollutant load reductions by allowing storm water to infiltrate into the soil. Some pollutants are removed from the percolating water by adhering to soil particles. Microorganisms that are naturally present in the soil biochemically break down and

remove some of the attached pollutants, and also feed on some of the dissolved pollutants. Types of infiltration systems include seepage pits and beds, trenches, porous pavement, and channels and vegetated swales with permeable beds. Pretreatment systems, such as grit chambers or detention ponds, are often used to prevent clogging of the infiltration bed. In some locations, the use of infiltration systems may require the installation of monitoring wells to ensure that contamination of groundwater does not occur.

Filtration systems - provide pollutant load reductions by filtering storm water runoff through media, typically sand or peat. The filter systems typically include a sedimentation area to retain the largest particles and a filter chamber that filters and removes soluble constituents. Filtration systems are typically constructed underground which minimizes land use requirements.

Grassed swales - reduce storm water runoff volume by allowing infiltration into the soil, and reduce storm water pollutant loads by filtering through vegetation. Vegetation traps sediments and utilizes nutrients, while microorganisms in the soil biochemically remove dissolved pollutants. The sediments trapped by vegetation are not as easily re-suspended during subsequent storm water runoff events as sediments accumulated in storm sewers, which are readily flushed out during later storms.

Constructed or retrofit wetlands - stabilize storm water runoff and flood flows and remove sediment and nutrients from surface water runoff. The wetland configuration slows runoff volume and provides storage opportunity. The wetland vegetation traps sediment and utilizes nutrients to reduce pollutant loadings.

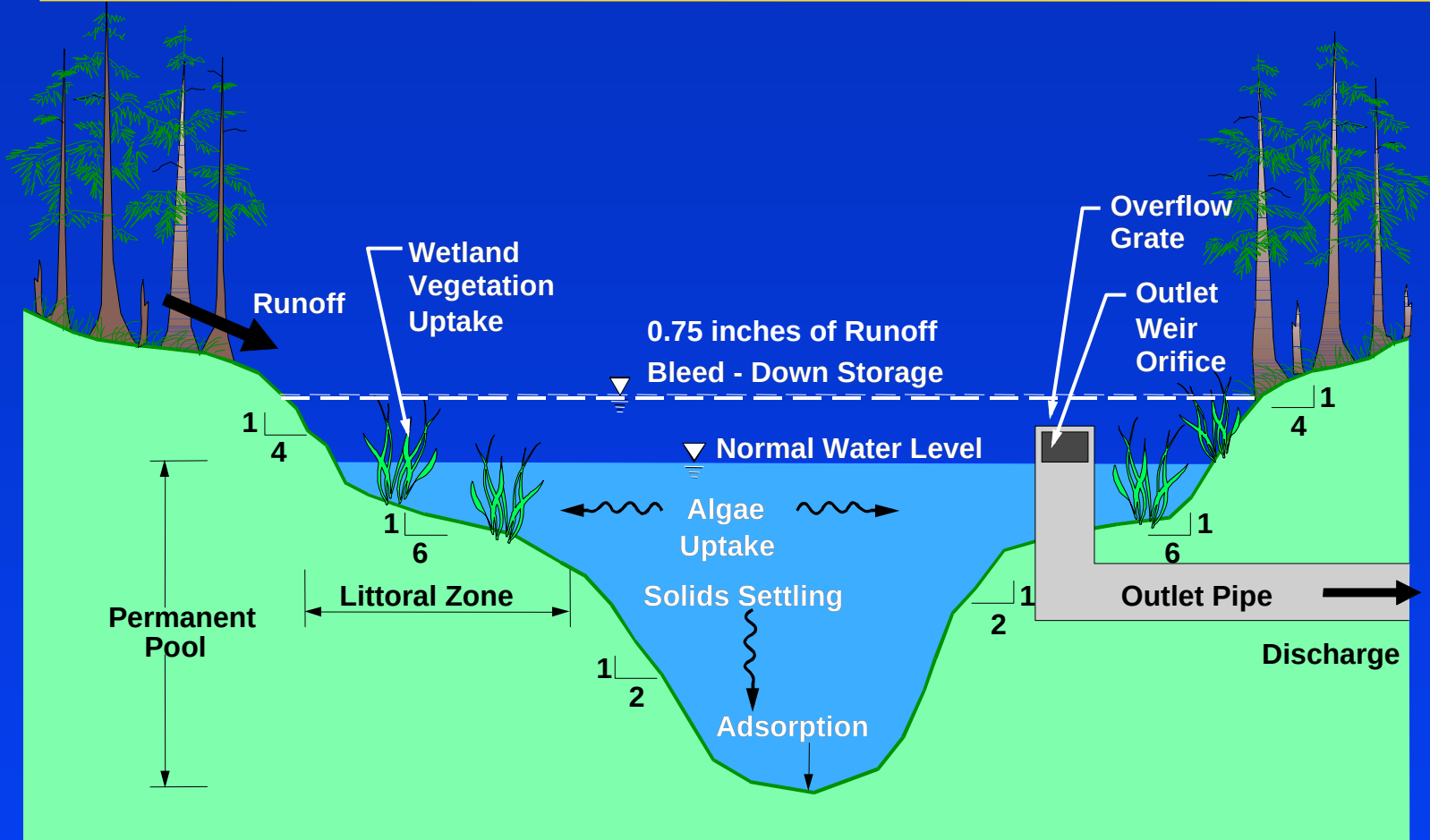
Engineered storm water drainage facilities - efficiently and effectively convey storm water runoff to receiving waters. Engineered facilities include storm sewers, culverts, constructed channels, catch basins, and manholes. Where flooding or drainage problems occur, these facilities can sometimes be upgraded to provide additional capacity to resolve the problems.

Streambank erosion controls - prevent channel degradation, reduce sediment transport and deposition, maintain channel capacity, and enhance water quality. Both structural (i.e., riprap) and vegetative controls may be used. Vegetative bank stabilization measures can enhance aquatic habitats and provide a natural appearance to the channel.

Buffer easements - vegetated zones adjacent to waterways or other environmentally sensitive features that serve to filter out pollutants in overland flow. The easements can also help stabilize streambanks, provide wildlife habitat, and offer stream shading.

Best Management Practices (BMPs) or source controls - include good housekeeping practices, preventive maintenance measure, spill prevention and response procedures, sediment and erosion controls.

Typical Wet Detention Pond

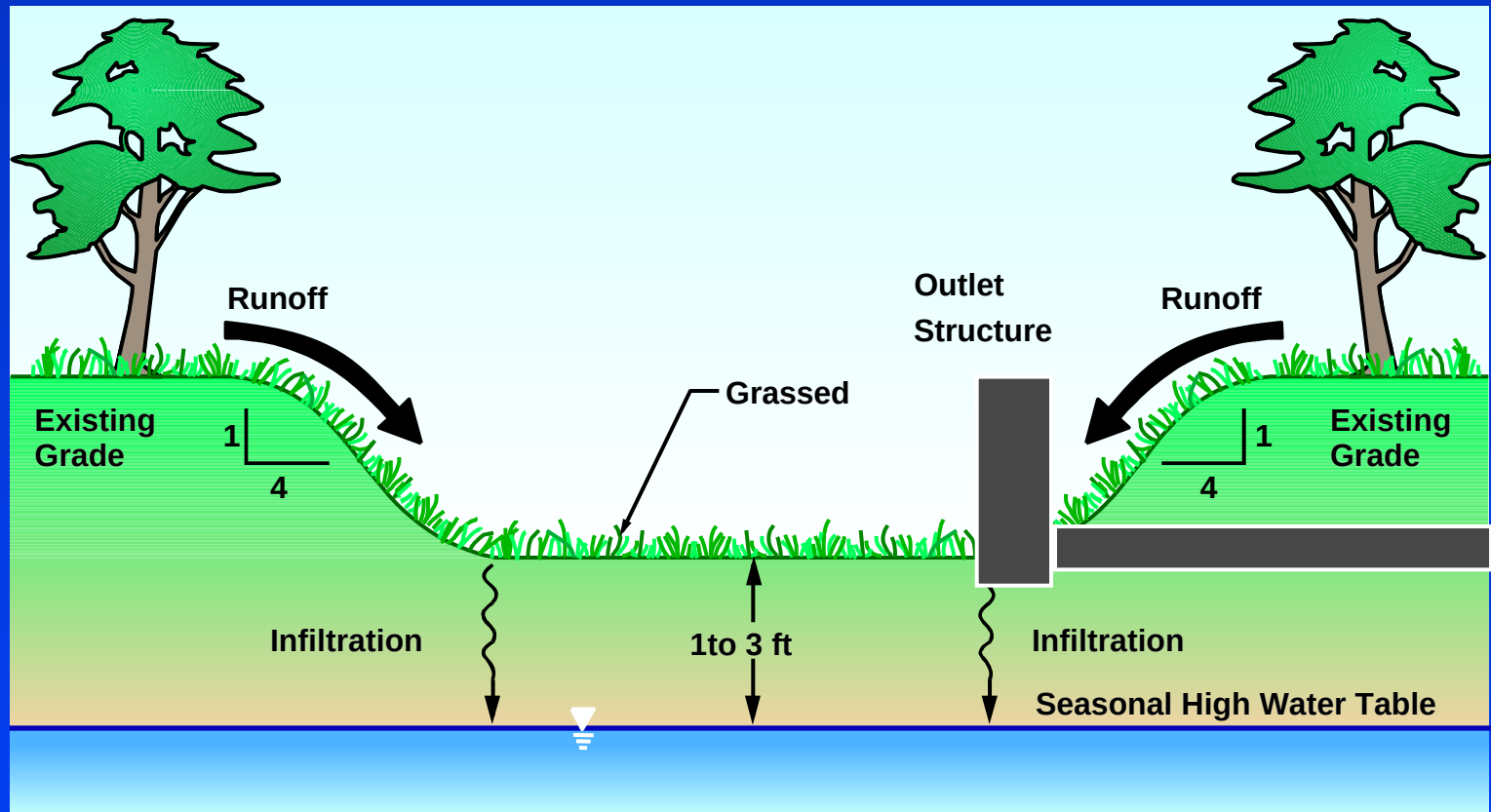


Notes:

1. Runoff is directed to the pond and detained for flood control and treatment by algae and vegetative uptake, solids settling, and adsorption.
2. The first 0.75 inches of runoff is typically detained above a permanent pool (with no more than half discharged in the first 24 hours) for water quality treatment.

Figure 8-1

Typical Dry Detention Basin



Notes:

1. Runoff is directed to the pond and detained for 6 to 24 hours before discharge to downstream.
2. The first 0.5 to 1.0 inches of runoff is typically detained for treatment and attenuation.
3. Infiltration and evapotranspiration provide for recovery of storage (6 to 24 hours for treatment volume).
4. Sideslopes should be no steeper than 4 horizontal to 1 vertical.

Figure 8-2

Inlet filters - typically consist of a frame with a screen filter or other filtration or absorbent media placed into a storm sewer inlet or catch basin. Storm water draining to the inlet passes through the filter, which traps sediment, floatable substances, and other pollutants, such as metals, associated with sediments.

Pavement cleaning - with mechanical or vacuum sweepers, removes sediments and associated pollutants from streets and parking lots. The effectiveness of sweeping can be improved by sweeping more frequently or by using improved sweeping techniques or equipment.

Catch basin cleaning - is an effective measure to remove accumulated deposits from catch basins and manholes. Frequent cleaning of the catch basins facilitates the trapping of additional sediments and prevents the scouring and re-suspension of accumulated sediments during subsequent storm events.

Public information and education programs - can increase the public's knowledge and understanding of storm water management, change people's attitudes and actions, and generate support for the implementation of the plan. Examples of public education programs include informational materials, posters, public announcements, press releases, presentations, workshops, video presentations on cable television, direct mailings, and personal contacts.

Water quality monitoring - may include the sampling and analysis of storm water or receiving waters, dry weather testing for non-storm water discharges, bottom sediment testing, biological assessments, and inspection of potential pollution sources and management measures. These monitoring programs may be designed to clarify existing water quality conditions, identify newly developing problems, monitor the implementation of the plan, and evaluate the effectiveness of the controls.

Urban land development guidelines - assist municipalities, residents, and developers in minimizing the adverse environmental impacts of urban development, while providing for safe and efficient urban services. These guidelines help prevent the creation of new storm water problems or the exacerbation of existing storm water problems. These guidelines may include:

- Establishing site grading requirements and zoning restrictions
- Requiring buffer zones or green spaces along streams
- Building setbacks distances from streams
- Defining allowable peak rates and volumes of discharge
- Protecting wetlands and other sensitive areas
- Providing water quality improvement

- Implement operations and maintenance activities

8.2 Storm Water Drainage and Flood Control Options

Options related to storm water drainage and flood control are typically either detention/storage measures or hydraulic system improvement measures.

Detention/storage measures include wet and dry detention ponds and extended detention basins where storm water runoff is collected and detained in a storage area and released slowly during and after the storm event. Detention/storage measures reduce peak runoff flows which reduce the required capacity of the downstream hydraulic system. Hydraulic system improvements focus on system modifications to improve conveyance capacity such as channel widening, channel clearing and culvert improvements.

An effective storm water management plan requires the selection of the most appropriate option to address each identified drainage or flooding problem. Storm water problem areas were identified based on field investigation, review of citizen complaint records, and computer modeling. This study focuses on storm water problem areas within the primary storm water management system. Basement back up due to overloading of the sanitary sewer, and localized flooding, sideyard or backyard flooding in areas not part of the primary drainage system, are not evaluated as part of this plan and are not considered in the major flooding areas identified.

8.2.1 Storm Water Drainage and Flooding Option Criteria

Design criteria for storm water flood control solutions are established based on the storm water management goals and objectives identified in Section 2 of this report. These criteria include:

- New facilities will provide protection against structure flooding and road overtopping in the 100-year recurrence interval storm event.
- Channels, bridges and culverts in the major storm system should be designed to accommodate runoff from the 100-year recurrence interval storm event.
- Storm sewers and roadside ditches in the minor storm system should be designed to accommodate runoff from a 10-year recurrence interval storm event.
- Emergency spillways for detention basins should be established to safely convey flow during a 100-year recurrence interval storm event.

8.2.2 Storm Water Flooding Options

Eight primary system storm water flooding problem areas were identified in Section 7 based on:

- Review of citizen complaint records: citizen complaint logs from the March and August 1998 storm event, as well as other storms, were reviewed and mapped

- Potential for damage: flooding areas which threaten homes or other structures
- History of the severity of the flooding problem: based on the knowledge of the City of New Berlin Staff

The flooding areas and storm water management options considered for each primary storm water flooding area are summarized in Table 8-1 and are discussed in the following paragraphs.

Problem UNDERWOOD1: Underwood Creek at Meadow Lane

Description: Along Meadow Lane between 128th and 124th Street, the South Branch of Underwood Creek is enclosed in a rectangular storm sewer that is 9 feet wide by 4 feet high initially, and ultimately is 14 feet wide at 124th Street. There are numerous reports of house, yard and street flooding associated with this enclosed channel. The causes of these problems include the following:

- < Analysis of the culvert entrance using the computer model indicates the storm sewer is undersized for the 100-year storm flow. This deficiency results in overtopping of the storm sewer entrance and backwater upstream toward Elm Grove Road.
- < Citizens have reported that debris accumulates at the storm sewer entrance during major storm events. Debris can further reduce the culvert entrance capacity and worsen the backwater and overflow problem.
- < The outlet of the storm sewer in Greenfield Golf Course is restricted by growth of trees and shrubs in the channel overbanks and accumulated sediment.
- < Reported yard and street flooding between 124th and 128th Streets is due to restricted surface inlet capacity and lack of a sufficient positive drainage path toward and across 124th Street. This problem is made worse by poor channel maintenance and the presence of fences, sheds, and other obstructions in the channel upstream of the inlet.
- < There is no well defined flow path over 124th Street to carry excess flows when the storm sewer is full.

Options: Assuming that buyouts and floodproofing are not acceptable in this area, there are two basic options to solve this flooding problem: reduce the flow of the storm sewer entrance with upstream detention storage or increase the conveyance capacity of the box. Storage will be considered in conjunction with problem UNDERWOOD2a. Like all storage retrofits, it is an extremely expensive solution but would provide significant, reliable flood relief. The capacity shortfall could be addressed partly by improving the entrance to the storm sewer on the

Table 8-1: Summary of Flooding Problem Options

Problem Number	Problem Description	Alternative Solution	Level of Protection			Estimated Construction Cost
			100 Year	25 Year	10 Year	
UNDERWOOD 1	Along Meadow Lane between 128th and 124th St., the South Branch of Underwood Creek is enclosed in a storm sewer. Overflow of box culvert entrance at 124th St. and Meadow Lane floods basements and backyards. There are numerous reports of house, yard, and street flooding associated with this enclosed channel.	A. Reduce flow with upstream detention storage/increase conveyance capacity of entrance. Upstream storage provided by UNDERWOOD 2a solution.	X			\$50,000 - \$100,000*
		B. Construct added storm sewer capacity.	X			Not Calculated**
UNDERWOOD 2a	Overbank flooding of yards and homes along the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. Flooding southwest of the intersection of Elm Grove and Meadow Lane.	A. Floodplain Lowering between Sunny Slope Road and Arcadian Drive.	X			\$1,480,000
		B. Storage Facility north of Greenfield Avenue in the City of Brookfield. (significant land acquisition cost may be required)	X			\$790,000
UNDERWOOD 2b	Yard, street, and basement flooding in the Gatewood Park neighborhood.	A. Additional 60-inch storm sewer to serve Gatewood Park.		X		\$400,000
ROOT 1	One residence experiences flooding along Park Ave near Elm Grove Rd. Yard flooding and erosion in backyards on north side of Park Ave.	A. Installation of new culvert at Graham St. and channel expansion between Graham St. and Elm Grove Rd.		X		\$101,000
ROOT 2	15 Homes are within the floodplain in the area bounded by Cleveland Ave., National Ave., 24th St., and 132nd St. Road flooding on Lagoon Rd. north of Cleveland Ave. Washout of private bridge at 128th St. and Cleveland Ave.	A. Online detention storage at four locations and floodplain lowering.	X			\$2,500,000
		B. Buyout 15 residences within floodplain.	X			\$2,940,000
ROOT 3	House flooding upstream of Grange Ave. near Francis Ave.	A. Replace culverts at St. Mary's Dr. and lower floodplain south of Grange Ave.	X			\$350,000
ROOT 4	Yard flooding and erosion near Honey Lane and Elm Grove Road. Flooding of 1 residence and several yards east of the intersection at Elm Grove and Honey Lane.	A. Re-grade roadside ditches and railroad ditches.			X	\$30,000
DEER 1	6 residences experience structural flooding along 168th Street in the Buena Park neighborhood south of Greenfield Ave. The flooding is caused by inadequate drainage. Sump pumps discharge to the drainage ditch and lawn clippings and yard waste contribute to culvert blockage.	A. Construct new storm sewer/pump station	X			Not Calculated**
		B. Reconstruct ditches with some segments of storm sewer from Fullerton to Roosevelt. Redirect sump pumps to discharge to lawns. Maintain clean culverts and ditches			X	\$180,000
		C. Floodplain storage / pump station in Buena Park	X			Not Calculated**

Notes: * requires implementation of UNDERWOOD 2 solution.

** Options containing multi-million dollar solutions were not calculated.

Cost estimates do not include environmental impacts (i.e. contaminated soil), legal, financing, or land acquisition costs.

north side of Meadow Lane near 128th Street. Proposed improvements would include a sloped trash rack that is less susceptible to debris clogging. Also, a program of improved maintenance would be beneficial. Initially the interior of the storm sewer should be inspected to determine the extent of accumulated sediment within the storm sewer and immediately downstream in West Allis. Then the cost of restoring the full capacity of the storm sewer could be determined. The entrance improvements and removal of obstructions would cost \$50,000 to \$100,000 depending on the amount of debris that has made its way deep into the storm sewer. There would be additional operation and maintenance costs to clean the entrance after storms. It would also be possible to construct additional storm sewer capacity. However, this would be very expensive and difficult to permit because it would increase flows downstream.

Problem UNDERWOOD2a: Underwood Creek near Elm Grove Road

Description: This problem involves overbank flooding of yards and homes along a reach of the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. The primary cause of the problem is that the properties are in or very close to the 100-year floodplain in this area. Limited capacity of the Arcadian Drive and Elm Grove Road culverts also contributes to this problem.

Options: The available options to solve this problem include upstream storage, conveyance improvements, or floodproofing. Conveyance improvements in this area will increase the flow downstream at this location. Increased flows would likely increase the flooding potential in the area of Meadow Lane and 128th Street.

Two storage solutions were investigated. The first involves channel widening and floodplain lowering between Sunny Slope Road and 300 feet upstream of Arcadian Drive. This “in-channel” storage solution would provide approximately 50 acre feet of storage and would lower water levels by approximately 1.5 feet at Elm Grove Road. The estimated cost of constructing this channel storage is \$1,480,000.

A more effective storage approach would be to construct an offline storage basin to control flows. The only available location where there is existing open land to construct a basin is north of Greenfield Avenue in the City of Brookfield. A basin covering approximately 5 acres could be constructed to hold 30 acre-feet of storage. When completed, this basin would reduce flows in the South Branch of Underwood Creek by approximately 100 cubic feet per second (cfs). This reduction would solve the flooding problems at Elm Grove Road and Meadow Lane and could be used to address drainage problems in the Gatewood

Park neighborhood. The basin would cost approximately \$650,000 to build plus the cost of acquiring the site which is estimated at \$600,000 for the purpose of comparison in this plan. In addition, \$140,000 in storm sewer improvements would be needed to divert flows into the basin.

Problem UNDERWOOD2b: Gatewood Park

Description: There are problems with yard, street, and basement flooding in this neighborhood located southwest of the intersection of Greenfield and Sunny Slope Roads. The neighborhood is drained by roadside ditches that flow north to a main drainage way along Greenfield Road. The problems are caused by a combination of factors. The neighborhood area is quite flat. Thus, there is widespread flooding when the ditches overflow. The lack of topographical relief also reduces the capacity of the ditches. However, roadside ditches are minor storm water drainage system components and the problem in Gatewood Park is an inadequate primary system. The system outlet at Sunny Slope Road is inadequate and there is insufficient capacity in the conveyance system to provide for runoff from Highland Cemetery west of the area.

Options: There are limited options available to solve the problems in Gatewood Park. There are no storage site available and the alternative to storage is a high capacity storm sewer system. Retrofitting the area with storm sewers would cost \$1.0 to \$2.0 million depending on whether a partial of full system is constructed. The level of service could be improved by increasing the capacity for conveying flow across Sunny Slope Road. The current outlet is a 60-inch storm sewer which serves Gatewood Park, Greenfield Avenue, and a 128-acre area north of Greenfield Avenue in Brookfield. This storm sewer provides approximately 80 cfs capacity while the 100-year flow from Gatewood Park and Greenfield Avenue is 196 cfs and the flow from Brookfield is 101 cfs. An additional 60-inch outlet and storm sewer serving Gatewood Park would cost about \$400,000 to construct. This project would increase flows in the South Branch of Underwood Creek downstream of Sunny Slope Road. Therefore, it should be constructed in conjunction with one of the storage projects recommended for problem UNDERWOOD2a or appropriate easements should be obtained to compensated for the downstream flow increases.

Problem area ROOT1: 130th Block of Park Avenue

Description: One residence experiences flooding along Park Avenue due to inadequately sized downstream culvert at Graham Street. Also, inadequate drainage ditch capacity exists between Elm Grove Road and Honey Lane south to the golf course.

Options: The capacity of the Graham Street culvert will be increased by installing 36 inch culvert to eliminate backwater effects. To mitigate potential increases in flow, 2,000 feet of channel between Graham Street and Elm Grove Road will be expanded. The expansion of the channel provides 5.4 acre-feet of storage to offset the increased flow at Graham Street. The estimated cost of this option is \$101,000.

Problem ROOT2: 132nd Street to Lagoon Road along Cleveland Avenue

Description: Approximately 15 homes are within the floodplain in the area bounded by Cleveland Avenue, National Avenue, 124th Street, and 132nd Street. The inlet and outlet configuration of the culverts are not parallel to the stream at the eastern Lagoon Road culverts and Cleveland Avenue. Road flooding occurs on Lagoon Road north of Cleveland Avenue. A Private bridge at 128th Street and Cleveland Avenue has been washed out.

Options: The first option is construction of online detention storage at four locations. The first will be in a low-lying area at the southwest corner of Cleveland Avenue and 131st Street extended. The other locations are the southeast corner of 128th Street and Cleveland Avenue, south of National Avenue approximately at 130th Street extended, and floodplain lowering along a 100-foot buffer on the east side of the stream southwest of 124th Street and Cleveland Avenue. These sites provide a total of 20 acre feet of storage. The estimated cost of the proposed storage facilities is \$2,500,000.

A second option requires the buyout of the fifteen residences in the floodplain between Lagoon Road and 130th Street along Cleveland Avenue. The estimated cost of these buyouts is \$2,940,000.

Problem ROOT3: LaSalle Drive and Grange Avenue

Description: A structure located adjacent to a tributary of the Upper Root River near Grange Avenue experiences flooding. The problem is caused by inadequate culvert capacity downstream at St. Mary's Drive.

Options: The twin 3-foot by 11-foot concrete box culverts at St. Mary's Drive are more than half filled with accumulated sediment. The resulting reduced capacity is the cause of this problem. Removing the sediment is a short term solution. However, the problem would likely recur due to the geometry of the existing culverts. These culverts are too wide for the channel in which they are located. Thus, sediment tends to accumulate in the under-used part of the overall width. The permanent solution will be to replace these culverts with taller,

narrower pipes and raise the road to accommodate them. The culverts need to be equivalent to three 60-inch diameter culverts. The estimated construction cost of the culverts is \$120,000. This construction cost does not include road improvements necessary to accommodate the culverts. To mitigate potential flow increases caused by the added conveyance capacity, the floodplain will be lowered south of Grange Avenue extending south to near Upper Kelly Lake. The total estimated cost for this option is \$350,000.

Problem ROOT4: Honey Lane

Description: Yard flooding and erosion are experienced by several residences along a tributary to the Upper Root River and also drainage problems along the railroad tracks north of Honey Lane near Elm Grove Road. The problem is caused by inadequate culverts and channel capacity.

Options: Currently, patches of low-lying areas along the tracks accumulate water resulting in the flooding of yards of neighboring properties. The ditches along the southern boundaries of the Union Pacific Railroad require spot re-grading from Woodshire Drive to 124th Street. Ditch re-grading is also proposed north from Ferguson Road and along the west side of Old Oak Lane to the south side of Park Avenue extending to Sunny Slope Road. Additional re-grading should extend north of Old Oak Lane to the north side of Honey Lane and then to Sunny Slope Road. The total length of ditch regrading is 3,000 feet. The estimated cost of this option is \$30,000.

Problem DEER1: Buena Park

Description: Six residences experience structural flooding along 168th Street in the Buena Park Neighborhood south of Greenfield Avenue. Several additional residences experience yard and basement flooding. The problem stems from backup from inadequate culverts, ditch capacity, and lot grading. The general area slope is very flat. In addition, most homes have sump pump discharge into the ditch. Lawn clippings and yard waste contribute to culvert blockage.

Options: The Buena Park neighborhood originally developed with insufficient lot grading to accommodate an open channel ditch conveyance system. Many homes have low water entry elevations at or below the top of the roadside ditch. The ditch slope is very flat and cannot be increased. When ditch capacity is met, the runoff potentially floods the homes. Raising homes one to two feet is not a practical solution. Floodproofing homes is also difficult to implement or fund.

The storm water discharge location for the neighborhood is into the floodplain of Deer Creek at Buena Park. Rainfall events greater than minor storms can be restricted from release into the park and create a backwater effect upstream. Increasing culvert capacity is not a remedial solution in a backwater effected area. Installing a new storm sewer system with associated pump station is not cost effective with pump station. Construction of large floodplain detention in Buena Park is also not cost effective.

The most practical solution is to maximize the existing system. Reconstruction of the ditches, including some storm sewer sections, from Fullerton to Roosevelt will help to discharge the water in the drainage ditch. Additionally, all sump pumps should be discharged to the lawn. Home owners should create as much positive drainage away from the house as possible. Ditches should be clear of yard waste and debris. Crushed driveway culverts should be replaced. Buyout of homes in the Deer Creek floodplain may be considered in the future.

8.2.3 Culvert Capacity Improvements

Analysis of the primary and secondary culverts indicates that 32 primary system culverts and 83 secondary culverts have deficient capacity.

Culverts identified as deficient in the primary and secondary storm water management systems are listed in Table 7-2 and 7-3, respectively. Some of the culvert deficiencies would be resolved through implementation of the recommended storm water improvements.

8.2.4 Drainage Ditch Improvements

Thirty-two drainage ditch problem areas were identified in Section 7 and listed on Table 7-5. The improvements require maintenance operations for restabilization, clearing of sediment, or collection of debris. Future problems will be identified and resolved through the implementation of the operations and maintenance program.

8.2.5 Further Study of Minor System Problems

Thirteen minor system problems were identified in Section 7. It may not be cost effective to solve minor system problems based on the current level of damages. However, further study of specific areas may be warranted based on staff recommendations at a later date (such as the Parkwood Lane storm sewer capacity).

8.3 Storm Water Quality Options

Options related to water quality improvement generally consist of treatment measures or source control measures. Treatment control measures are designed to treat storm water runoff prior to discharge to a receiving stream. Non-structural

measures generally involve a change in procedure and are designed to reduce the amount of pollutants in the storm water runoff from an area.

8.3.1 Source Control Options for Storm Water Quality Improvement

Source controls considered effective for specific areas in New Berlin are presented on Table 8-2. Options recommended for consideration in the final recommended plan are described below:

Industrial Best Management Practices

Subchapter 2 of the Wisconsin Administrative Code NR216 regulates industrial storm water dischargers. Industries which are regulated by NR216 are required to identify sources of potential storm water pollution at their facilities and implement best management practices to reduce or eliminate pollutants from the identified sources. The permit issued to industries generally requires the facility to implement the following general types of best management practices:

- Good housekeeping: practices intended to maintain areas in a clean and orderly manner
- Preventive maintenance: practice to maintain equipment and systems
- Spill prevention and response: practices which reduce the potential for a spill to occur and minimize the effect of a spill
- Sediment and erosion control - practice to reduce sedimentation and erosion

Pollutant reductions from the implementation of the industrial storm water regulations are estimated to range from 15 to 20 percent. Individual industries are responsible for the costs related to industrial storm water permit compliance.

Based on the industrial analysis specific best management practices are recommended for various industry groups. The suggested industrial best management practices recommended for specific industrial groups are presented in Appendix F.

Pavement sweeping

New Berlin currently sweeps all of the streets on an annual basis. The effectiveness of a sweeping program pollutant reduction is directly related to the frequency of sweeping between storm events. The frequency of early spring street sweeping is critical because studies have indicated that pollutant

Table 8-2: Comparison of Source Control Alternatives

Alternative	Pollutant Removal Effectiveness				Cost		Comments	Recommended for Further Consideration
	Winter Loading	Sediment	Nutrients	Metals	Capital	Maintenance		
Industrial Best Management Practices	o	o	-	o	o	o	Required for most industries for compliance with NR216	Yes
Pavement Sweeping	+	o	-	+	o	o	Frequency and timing determine effectiveness. Effectiveness is reduced on roadways without curbing.	Yes
Snow/Ice Management	+	o	o	o	o	-	Snow storage locations and deicing techniques	Yes
Landscaping Practices	-	o	+	+	+	+	Fertilizer and pesticide management	Yes
Catch Basin Cleaning	o	o	o	o	+	+	Frequency and timing determine effectiveness	Yes
Erosion Control Ordinance	-	+	-	-	o	o	New Berlin has an erosion control ordinance - increase enforcement	Yes
Storm Water Management Ordinance	o	+	o	o	-	-	Draft ordinance includes provisions for water quality improvements for developing lands.	Yes
Public Education and Information	o	o	o	o	+	o	Can use existing materials developed by WDNR and the UW-Extension Will help in reduction from residential areas	Yes
Agricultural Practices	o	+	+	-	+	o	Includes vegetated Filter strips and barnyard runoff controls	Yes

Notes: + indicates HIGH Pollutant Removal Effectiveness/ LOW Cost
 o indicates MODERATE Pollutant Removal Effectiveness/MODERATE Cost
 - indicates LOW Pollutant Removal Effectiveness/ HIGH Cost

loadings from spring snowmelt can account for one- to two-thirds of the annual pollutant loadings from urban areas. Pavement sweeping options incorporate:

- #Curbed highways and arterials
- #Rural cross section roadways (no curbs)
- #Commercial/Industrial parking lots

A comparison of the effectiveness and cost of street sweeping schedules is presented in Table 8-3. The effectiveness of street sweeping on non-curbed streets will be reduced.

Table 8-3: Comparison of Street Sweeping Schedules

Frequency of Sweeping	Estimated Pollutant Reduction (%)
Monthly	10 %
Seasonal (weekly - April & May, bi-weekly - June through September; monthly October, November & March)	25 %
Bi-Weekly	30%

Catch basin cleaning

Catch basins are designed to collect and temporarily store sediment and debris. Regular cleaning, to remove the collected materials, improves the pollutant removal effectiveness of the catch basins. New Berlin has catch basins within areas of the storm sewer system. Storm sewered areas are limited within the city.

A catch basin cleaning schedule of twice per year, once in spring and fall of each year was evaluated. The estimated pollutant reduction for semi-annual catch basin cleaning is 17 percent for sediment and 25 percent for metals. Alternatively catch basins could be inspected quarterly and cleaned when about 40 percent full.

Installation of catch basins in developing areas or areas undergoing redevelopment will improve water quality from the drainage area and should be considered. Existing catch basins should be replaced/retrofitted as needed and during construction activities.

Landscape Practices

Park and institutional land uses contribute about 19 percent of the study area total phosphorous loading. The major source of the phosphorous is landscaping

practices. Landscaping practices which will reduce the pollutant loading in this area include:

- converting high maintenance lawn areas into low impact areas planted with ground cover, trees, shrubs, or perennials;
- test soils and adjust fertilizer applications accordingly;
- only water landscaped areas in early morning hours;
- increase average turf height to three inches to improve turf health and reduce weed growth; and
- consideration of low toxicity weed control.

Implementation of these landscaping practices may result in approximately a 10 percent reduction in phosphorous loadings.

Snow and Ice Management

Parking lots and roadways are plowed to remove snow fall as needed during the winter months.

In order to provide a reduction in pollutant loadings from the snow melt, a vegetated filter area should be provided between snow storage areas and receiving streams or storm sewer inlets. Additional snow and ice management practices include:

- tailoring the application rate of de-icers to the use of the area;
- training handlers of road salt to improve the efficiency of deicer application and reduce losses;
- equip trucks with ground-speed sensors;
- promptly clean-up spills after loading operations;
- monitor the deicer market for the development of new products and price reduction of existing products; and
- sweeping accumulated salt and grit from paved areas as soon as practical after the surface clears of snow and ice.

Implementation of snow and ice management practices can result in pollutant reductions up to 15 percent of the total annual loading.

Erosion Control Ordinance

The City of New Berlin currently has an erosion control ordinance which provides adequate authority to control sediment from land disturbing activities. In order to

improve compliance with the ordinance a vigorous site inspection program should be implemented by the City. The inspections should be conducted by qualified staff to check for proper implementation of erosion control measures during construction. Inspections should be conducted during or after storm events to observed the effectiveness of the measures implemented. Post construction inspections should also be conducted to check for signs of site erosion, as well as to evaluate the downstream impacts of the project.

Storm Water Management Ordinance

The City of New Berlin draft storm water ordinance which includes provisions for implementation of storm water quality improvements for developing land. New Berlin should adopt and enforce this ordinance to meet the water quality goals described in Section 3 of this Plan.

Agricultural Practices

Agricultural Best Management Practices including conservation tillage, streambank erosion control, vegetated drainage ways, and barnyard runoff controls should be encouraged in all agricultural areas of New Berlin. Additionally, a shoreland management ordinance which requires maintenance of buffer strips along all perennial and intermittent streams within the City of New Berlin should be established. The pollutant removal effectiveness of buffer strips ranges from 40 to 70 percent. The ordinance should require that the agricultural buffer strips be maintained even if the land is otherwise developed. A model draft ordinance from Ozaukee County Land Conservation Department is in Appendix G.

Public Information and Education

A public education and information program established to target the general public, city staff, and industries will assist New Berlin in its efforts to implement a storm water management program. An information and education program will increase the public's knowledge and understanding of storm water management, change people's attitudes and actions, and generate support for the implementation of this plan. An education program for the general public should include:

- storm water management goals,
- lawn care and landscaping,
- pet waste handling, and
- other best management practices.

An education and training program for City staff could be developed. Highway maintenance crews, Park and Recreation employees, and construction inspection personnel would all receive training and education about erosion, plant life, soil,

and storm water. An industrial education program should focus on compliance with the NR216 industrial storm water regulations and improved selection and implementation of best management practices. A public education program may include informational materials, posters, public announcements and press releases, presentations, workshops, video presentations on cable television, direct mailings, and personal contacts. Information for education programs is available from the University of Wisconsin Extension office, Waukesha County Land Conservation Department, and New Berlin School District. The New Berlin School District is currently helping administer a \$16,000 matching grant from the Wisconsin Environmental Education Board to educate the public. Additional storm water-related curriculum could be developed. Waukesha County Land Conservation Department also has relevant publications and there is public education and equipment available (with training) for water testing at no cost through Retzer Nature Center.

8.3.2 Treatment Options for Water Quality Improvement

Storm water treatment options considered for New Berlin are compared in Table 8-4. Treatment options recommended for consideration in the final recommended plan are described below.

Wet detention basin/pond

Water quality detention ponds include a forebay and adequate sizing to provide the required conditions for pollutant reduction. Pollutant removal effectiveness by wet detention ponds is estimated to be 90 percent for sediment, 50 percent for phosphorous, and 70 percent for lead. One location where a wet detention basin may be practical is summarized in Table 8-5. The water quality detention basin will reduce pollutants from the drainage area incorporating about 840 acres and will reduce the overall pollutant loading from the City of New Berlin.

Table 8-4: Comparison of Stormwater Treatment Alternatives

Alternative	Pollutant Removal Effectiveness				Cost		Comments	Recommended for Further Consideration
	Winter Loading	Sediment	Nutrients	Metals	Capital	Maintenance		
Wet Detention Pond	o	+	+	+	-	o	Can be combined with flood control alternatives	Yes
Extended Detention Basin	o	+	+	+	-	o	Can be combined with flood control alternatives	Yes
Constructed/ Retrofit Wetlands	-	o	+	o	-	o	Utilize prior converted wetland areas, may be an effective way to create additional habitat and remove pollutants from stormwater, can have flood control benefits	Yes
Standard Catch Basins	o	o	-	o	o	o	Potential for redeveloping areas, replace existing basins as needed	Yes
In-Line Treatment Systems	o	+	o	+	-	o	Vortech TM , Stormceptor TM , Other	Yes
Inlet Filters	o	o	-	o	o	-	Limited flows can be treated, requires routine maintenance, may be effective for industrial yards or parking lots	Yes
Filter Systems	+	+	o	+	-	o	Limited flows can be treated, may be effective for industrial yards or parking lot areas	Yes
Infiltration Systems	o	+	+	+	-	o	Requires sandy soils, potential groundwater contamination	Yes
Porous Pavement	o	o	-	o	-	o	Practical for very small areas only Winter maintenance activities may damage pavement, potential use in parking areas not used during winter months	No
Streambank Stabilization	-	+	-	-	o	o	Vegetative protection, rip rap, channel clearing and cleaning, deposit removal	Yes
Grassed Swales	o	+	+	+	-	+	Maintain existing swales	Yes

Notes: + indicates HIGH Pollutant Removal Effectiveness/ LOW Cost,
 o indicates MODERATE Pollutant Removal Effectiveness/MODERATE Cost
 - indicates LOW Pollutant Removal Effectiveness/ HIGH Cost

Table 8-5: Summary of Water Quality Detention Pond Options

Area/ detention pond/basin designation	Location	Existing Annual Pollutant Loadings from Drainage Area (Percent of Total Loading)	Reduction in Total Study Area Pollutant Load
Basin 2E071 <i>(basin recommended by others as part of the Lake Management Plan for Upper and Lower Kelly Lakes)</i>	West of Upper Kelly Lake	Sediment - 102 tons (2%) Phosphorous - 337 lbs. (3%) Lead - 250 lbs. (4%)	Sediment - 2% Phosphorous - 1.5% Lead - 3%

Typical maintenance for a wet detention basin includes routine mowing, debris and litter removal, and erosion control inspection. Non-routine maintenance includes sediment removal and structural repairs.

Constructed/Retrofit Wetlands

The wetland inventory described in Section 4 of this report identified numerous wetland areas throughout the New Berlin area. Wetlands classified as prior-converted have a very high potential for restoration of wetland features which could result in valuable water quality and flow improvements. Restoration of prior converted wetlands is often very simple. Wetland storm water management areas are identified in Table 8-6.

Table 8-6: Summary of Retrofit Wetland Options

Wetland Designation/ Location	Wetland Area Available (acres)	Wetland Volume Required for Retrofit (acre-ft)	Targeted Drainage Area (acres)	Existing Annual Pollutant Loading from Targeted Drainage Area	Pollutant Removal in Total Annual Load
33-1 / Basin 46060 North of Interstate Highway 43, west of Calhoun	25.4	2.5	64 acres of highway land use	Sediment - 31 tons (0.6%) Phosphorous - 139 lbs. (1%) Lead - 353 lbs. (6 %)	Sediment - 28 tons (0.5%) Phosphorous- 95 lbs. (0.7%) Lead - 265 lbs. (4%)
27-3 / Basin 4C020 North of Interstate Highway 43, west of Moorland Rd.	11.6	0.5	12.5 acres of highway land use	Sediment - 18 tons (0.3%) Phosphorous - 84 lbs. (0.6%) Lead - 212 lbs. (3%)	Sediment - 17 tons (0.3%) Phosphorous- 58 lbs.(2%) Lead - 159 lbs. (2.5%)
26-1 / Basin 4C030 South of Interstate Highway 43, east of Moorland Rd.	12.2	2	57 acres of highway land use	Sediment- 36 tons (0.7%) Phosphorous - 162 lbs. (1%) Lead - 409 lbs. (6 %)	Sediment - 33 tons (0.6%) Phosphorous- 114 (0.9%) Lead - 307 lbs.(4.8%)
14-2 / Basin 3A060 South of National Ave., east of Moorland Rd.	52.9	1	21 acres of commercial land use	Sediment -12 tons (0.2%) Phosphorous -24 lbs. (0.1%) Lead - 60 lbs. (0.9%)	Sediment- 11 tons (0.2%) Phosphorous- 17 lbs (0.1%) Lead - 45 lbs. (0.7 %)
34-2 / Basin 5A020 North of College Ave., west of Sunny Slope Rd., & east of Small Rd.	30.4	11	312 acres of agricultural and residential land use	Sediment- 47 tons (0.8%) Phosphorous -171 lbs. (1%) Lead - 34 lbs. (0.5 %)	Sediment- 42 tons (0.8%) Phosphorous-120 lbs (0.9%) Lead - 26 lbs. (0.4%)

Prior converted wetland areas should be evaluated for flood control and water quality improvement as new development is considered. The prior converted wetland areas which may be effective for storm water management are discussed in Section 4. The pollutant removal effectiveness for wetland management practices ranges from 80 to 99 percent of sediment loadings, from 50 to 99 percent of phosphorous loadings, and from 60 to 95 percent of lead loadings.

Standard Catch Basins

Standard catch basins collect sediment and pollutants in a sump prior to discharge of the storm water runoff to the storm sewer. Pollutants collected in the catch basins must be cleaned out to prevent flows from washing collected pollutants into the storm sewer. Catch basins are currently located in storm sewered areas.

In order to continue the current level of pollutant reduction existing catch basins should be replaced, as necessary, with new catch basins rather than direct storm sewer inlets. Additionally, standard catch basins should be provided where new development plans include an urban type cross section with storm sewer. Additional catch basin installation will improve water quality from the drainage area. The estimated pollutant reduction per catch basin is 20 percent of the sediment loading from the drainage area.

In-Line Treatment System

An in-line treatment type system such as Vortechs™, StormFilter™, or Stormceptor™ will treat storm water entering the basin and discharge the water to the existing storm sewer system. The in-line systems are underground chambers where storm water collects and is treated. Typical maintenance includes regular clean-out of the collected sediment with vacuum trucks. Construction and maintenance costs vary depending on the size of the system. Possible locations for an in-line collection system include the industrial park. However, based on the drainage numerous systems would be required to effectively reduce the pollutants discharging from this area. Therefore, the in-line drainage system is not recommended for consideration at this time. However, an in-line treatment system should be considered in areas of future development.

The pollutant removal effectiveness of the in-line treatment systems ranges from 70 to 90 percent of sediment, and 40 to 50 percent of the phosphorous load. The pollutant removal rate will vary with the type and sizing of system selected for installation. Estimated costs vary with the size of the unit, generally ranging from, \$45,000 to \$80,000 per unit.

Vegetated Drainage Ditches

Vegetated drainage swales are located throughout the City of New Berlin. The drainage ditches reduce storm water velocity and provide opportunity for pollutants to filter through vegetation. The regular maintenance program for the

drainage ditches, described in Section 9.6, will provide continued effectiveness for the removal of pollutants from drainage areas.

8.3.3 Discussion of Storm Water Quality Options

The above sections describe options which will assist New Berlin in improvement of water quality. The water quality objective, as identified in Section 3 of this report, is to provide water quality suitable to support the designated potential recreational and biological uses of the streams within New Berlin.

The water quality option effectiveness and cost are summarized in Table 8-7.

The options recommended for incorporation into the storm water management plan for the City of New Berlin are presented in Section 9.

8.4 Streambank Stabilization Options

Streambank stabilization measures include vegetative protection, rip rap protection, channel clearing and cleaning, and deposit removal. The streambank inventory identified about 13.6 miles of streambank which were classified as fair or poor. Of these reaches, 13.6 miles were identified for stabilization measures. The streambank reaches and actions needed are described in Table 8-8.

The options recommended for incorporation into the storm water management plan for the City of New Berlin are presented in Section 9.

8.5 Regional Storage Options

Regional detention options mitigate the cumulative impacts of the existing and future development in an area. Regional detention is often proposed because it can be more effective at controlling flood peaks than construction of individual storage ponds at numerous sites. Regional detention facilities may also be more cost-effective than individual basins due to the economy of scale associated with building one large pond and an associated inlet and outlet structures.

Regional detention has impediments to implementation that do not exist with detention at individual sites. Common problems associated with implementation of regional detention include:

Acquisition of a feasible site - There are many constraints on the site selected for regional detention: it must be located along the stream in the developing watershed, it should be downstream of the majority of the development and it must be large enough to satisfy the storage requirement.

Development of the site - The site topography must support detention pond operation by having sufficient channel frontage for a gravity inlet and outlet. The site must be reasonably low and flat so that excavation cost is not excessive. Workable sites

Table 8-7: Summary of Recommended Water Quality Control Options

Area of Concern	Option	Option Effectiveness (pollutant reduction within Drainage Area)	Estimated Pollutant Reduction (% reduction in total Annual study area load)			Estimated Capitol Costs*	Estimated Operation and Maintenance Costs per year
			Sediment (tons)	Phosphorous (lbs.)	Lead (lbs.)		
Entire Study Area	Public Information & Education Program	variable	--	--	--	variable	variable
Entire Study Area	Urban Planning and zoning in accordance with the City of New Berlin Zoning Map (change from existing to future land use)	variable	135 (12%)	750 (6%)	-2140 (-34%)	no cost anticipated for city	no cost anticipated for city
Entire Study Area	Adopt and Enforce the Draft Storm Water Management Ordinance	40 - 80%	480 (9%)	640 (5%)	890 (14%)	Costs incurred by developers	Costs incurred by developers
Industrial Best Management Practices	Industrial best management practices as required by Wisconsin Administrative Code NR216 and implementation of suggested industry specific practices	20%	35 (0.6%)	20 (0.2%)	200 (3%)	Costs incurred by industry	Costs incurred by industry
Roadways	Arterials and Industrial Park Roadways (approx 100 miles): Seasonal sweeping (weekly in April & May, bi-weekly from June through August, monthly from September thru November)	15%	30 (0.6%)	55 (0.45%)	170 (3%)	---	\$125,000
Winter pollutant loadings from paved areas	Ice management practices including improved salt distribution methods and training of salt truck drivers	14% in pavement loadings	variable	variable	variable	minimal	minimal
Catch Basin Cleaning and/or Retrofit	Catch basin cleaning twice per year and/or installation of catch basins in development or redevelopment areas	17 - 25%	0.04 tons/acre drained	--	0.05 lbs./acre drained	\$5,000 / new catch basin installed	\$70/catch basin /year for cleaning
Institutional and Park lawn /High Maintenance Turf Areas	Landscaping practices including increased turf height, reduced weed control, replacement of turf with low maintenance ground cover or perennials, reduced fertilizer application.	10%	20 (0.4%)	250 (2%)	10 (2%)	minimal	minimal
Snow Storage Areas	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way of storm sewer inlet	up to 15% of street loadings	variable	variable	variable	minimal	minimal

Table 8-7: Summary of Recommended Water Quality Control Options

Area of Concern	Option	Option Effectiveness (pollutant reduction within Drainage Area)	Estimated Pollutant Reduction (% reduction in total Annual study area load)			Estimated Capital Costs*	Estimated Operation and Maintenance Costs per year
			Sediment (tons)	Phosphorous (lbs.)	Lead (lbs.)		
New Construction Areas / Redevelopment Areas	Increase inspections for construction sites for compliance with the ordinance, provide erosion control techniques training for inspectors.	Variable	variable	variable	variable	minimal	minimal
Extractive Land Use Areas	Implement suggest best management practices	15%	170 (3%)	10 (0.1%)	1 (<0.1%)	cost incurred by industry	cost incurred by industry
Agricultural Land Use Areas	Encourage use of Agricultural best management practices such as conservation tillage and barnyard controls	5%	80 (1.5%)	310 (2%)	--	cost incurred by farmers	cost incurred by farmers
	Implement shoreland management ordinance	40 - 70%	280 (5%)	610 (5%)	5 (0.1%)		
Highway Land Use Areas	Retrofit three prior converted wetlands into storm water treatment wetlands for highway runoff. Locations are: north of I-43, west of Calhoun; north of I-43 west of Moorland ; and south of I-43 east of Moorland	70 - 90%	85 (2%)	385 (3%)	970 (15%)	\$75,000	to be determined
Basin 2E071 Kelly Lake	Construct water quality detention basin west of Kelly Lake	50 - 90%	85 (2%)	190 (1.5%)	15 (3%)	to be determined	to be determined
Basin 5A020	Retrofit one prior converted wetland into a storm water treatment wetland for agricultural and residential land use area south of National Ave., east of Moorland Rd.	70 - 90%	47 (0.8%)	170 (1%)	30 (0.5%)	\$165,000	to be determined
Basin 3A060	Retrofit one prior converted wetland into a storm water treatment wetland for commercial land use area north of College Ave., east of Small Rd.	70 - 90%	12 (0.2%)	20 (0.1%)	60 (0.9%)	\$15,000	to be determined

* These costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs which may be associated with the plan.

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.2 mile east of New Berlin Hills Golf Course property line northeast 0.1 mile	Poor	Poor landform slope cutting; fair mass wasting, debris jam potential, and vegetative bank protection	Protect , vegetate, and stabilize banks, remove potential jam materials
Upper Root River - C Designation	0.1	Tributary to Root River from pond north 0.1 mile to point extending south of Dakota St. and east of 134th St.	Poor	Poor landform slope and vegetative bank protection; fair mass wasting, debris jam potential, obstructions, cutting, and deposition	Protect , vegetate, and stabilize banks, remove potential jam materials, clean out sedimentation.
Upper Root River-A Designation	0.1	Tributary to Root River from point 0.1 mile west of New Berlin Hills Golf Course property line east to New Berlin Hills Golf Course property line	Fair	Fair landform slope, debris jam potential, vegetative bank protection, obstructions, cutting, and deposition	Protect , vegetate, and stabilize banks, remove potential jam materials and flow obstructions, clean out sedimentation.
Tess Corners Creek - A Designation	0.1	Tributary to Root River from College Ave. north 0.1 mile	Fair	Poor debris jam potential, vegetative bank protection, and obstructions; fair cutting	Remove potential jam materials and flow obstructions, vegetate or protect banks, repair cut areas.
Upper Root River - B Designation	0.1	Tributary to Root River from point 0.4 mile east of Sunny Slope Rd. southeast 0.1 mile	Fair	Poor landform slope; fair cutting and deposition	Repair cut areas, protect banks.
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.3 mile east of New Berlin Hills Golf Course property line north 0.1 mile	Fair	Poor landform slope; fair mass wasting, debris jam potential, and vegetative bank protection	Stabilize slopes, remove potential jam materials, vegetate or protect banks.
Poplar Creek	0.8	From Cleveland Ave. south to corner of Calhoun Rd. and Victor Rd.	Fair	Poor obstructions; poor/fair debris jam potential and vegetative bank protection; fair channel capacity, cutting, and deposition	Remove flow obstructions and potential jam materials, vegetate and protect banks, repair cut areas.
Upper Root River - A Designation	0.1	Tributary to Root River from point 0.1 mile east of New Berlin Hills Golf Course property line east 0.1 mile	Fair	Poor mass wasting; fair landform slope and debris jam potential	Stabilize slopes, remove potential jam materials.
Tess Corners Creek - A Designation	0.1	Tributary to Root River between Grange Ave. and College Ave.	Fair	Fair vegetative bank protection, cutting, and deposition	Vegetate and protect banks, repair cut areas.

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
Calhoun Creek - B Designation	0.2	Tributary to Calhoun Creek from point 0.2 mile south of Beloit Rd. southwest 0.2 mile to pond in Calhoun Park	Fair	Fair debris jam potential, obstructions, cutting, and deposition	Remove potential jam materials and flow obstructions, repair cut areas.
Underwood Creek - A Designation	1.0	Tributary to Underwood Creek from corner of Meadow Ln. and Sunny Slope Rd. east to storm sewer under Meadow Ln.	Fair	Poor/fair cutting; fair landform slope, debris jam potential, vegetative bank protection, and deposition	Repair cut areas, protect banks.
Upper Root River - D Designation	0.1	Tributary to Root River from point extending southwest of Manitoba Ave. north 0.1 mile	Fair	Fair landform slope, mass wasting, vegetative bank protection, and cutting	Stabilize upper slopes, vegetate and repair banks, repair cut areas.
Upper Root River - G Designation	0.1	Tributary to Root River from point extending northeast of White Ct. southeast 0.1 mile to corner of Howard Ave. and 128th St.	Fair	Fair debris jam potential, vegetative bank protection, and cutting	Remove potential jam materials, vegetate and protect banks, repair cut areas.
Upper Root River - C Designation	0.2	Tributary to Root River from point extending south of Dakota St. and east of 134th St. northeast to 133rd St.	Fair	Poor vegetative bank protection; poor/fair landform slope and cutting; fair mass wasting	Vegetate and protect banks, repair cut areas, stabilize upper slopes.
Poplar Creek - F Designation	0.6	Tributary to Poplar Creek from Cleveland Ave. northwest to junction with Poplar Creek	Fair	Poor/fair debris jam potential; fair landform slope, vegetative bank protection, obstructions, and cutting	Remove potential jam materials and flow obstructions, vegetate and protect banks, repair cut areas.
Deer Creek	0.2	From point south of 162nd St. east 0.6 mile to point between Glendale Dr. and Cleveland Ave.	Fair	Fair landform slope, mass wasting, cutting, and deposition	Stabilize upper slopes, repair cut areas.
URR-A Designation	0.3	Tributary to Root River from point 0.2 mile west of 124th St. in New Berlin Hills Golf Course east 0.3 mile	Fair	Fair landform slope, debris jam potential, obstructions, and deposition	Remove potential jam material and flow obstructions.

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
Deer Creek Designation	0.1	From Cleveland Ave. south 0.1 mile	Fair	Poor landform slope; fair debris jam potential and obstructions	Remove potential jam materials and flow obstructions.
URR-A Designation	0.2	Tributary to Root River from Meadowlark Dr. east to point 0.1 mile west of New Berlin Hills Golf Course	Fair	Fair debris jam potential, vegetative bank protection, cutting, and deposition	Remove potential jam materials, vegetate and protect banks, repair cut areas.
URR-D Designation	0.5	Tributary to Root River from point extending west of Ohio Dr. east to Highpointe Dr.	Fair	Fair obstructions, cutting, and deposition	Remove flow obstructions, repair cut areas.
Poplar Creek Designation	1.3	From junction with tributary UF-E southeast 1.3 miles	Fair	Fair debris jam potential, vegetative bank protection, cutting, and deposition	Remove potential jam materials, vegetate and protect banks, repair cut areas.
CC-B Designation	0.5	Tributary to Calhoun Creek from I-43 south to Westridge Dr.	Fair	Fair debris jam potential and vegetative bank protection	Remove potential jam materials, vegetate and protect banks.
Deer Creek Designation	0.6	From National Ave. northwest 0.6 mile	Fair	Poor obstructions; fair landform slope, debris jam potential, cutting, and deposition	Remove flow obstructions and potential jam materials, repair cut areas.
Deer Creek Designation	0.2	From junction with tributary DC-C north 0.2 mile	Fair	Poor obstructions; fair landform slope and cutting	Remove flow obstructions, repair cut areas.
CC-B Designation	0.7	Tributary to Calhoun Creek from I-43 northwest 0.7 mile	Fair	Fair debris jam potential, vegetative bank protection, obstructions, and deposition	Remove potential jam materials and flow obstructions, vegetate and protect banks.

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
CC-C Designation	0.3	Tributary to Calhoun Creek from I-43 north to point extending east of Dale Dr.	Fair	Fair landform slope and debris jam potential	Remove potential jam materials.
UF-A Designation	1.4	Tributary to Poplar Creek from Cleveland Ave. north 1.4 miles	Fair	Poor vegetative bank protection; fair landform slope, debris jam potential, obstructions, cutting, and deposition	Vegetate and protect bank, remove potential jam materials and flow obstructions, repair cut areas.
Poplar Creek Designation	0.1	From Calhoun Rd. west 0.1 mile	Fair	Fair landform slope and cutting	Repair cut areas.
CC-B Designation	0.1	Tributary to Calhoun Creek from Beloit Rd. northeast 0.1 mile	Fair	Fair debris jam potential and vegetative bank protection	Remove potential jam materials, vegetate and protect banks.
CC-H Designation	0.4	Tributary to Calhoun Creek from Linnie Lac southwest 0.4 mile to point extending north of College Ave.	Fair	Fair vegetative bank protection and obstructions	Vegetate and protect banks, remove flow obstructions.
URR-B Designation	0.3	Tributary to Root River from point extending north of Tammy Ln. east 0.3 mile to point 0.1 mile east of Sunny Slope Rd.	Fair	Fair vegetative bank protection and deposition	Vegetate and protect banks.
Poplar Creek Designation	0.7	From junction with tributary UF-L northeast 0.7 mile	Fair	Poor debris jam potential; fair obstructions and cutting	Remove potential jam materials and flow obstructions, repair cut areas.
URR-D Designation	0.1	Tributary to Root River from beginning near Long Acre Dr. east 0.1 mile	Fair	Fair deposition	

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
URR-E Designation	0.2	Tributary to Root River from 132nd St. east 0.2 mile	Fair	Fair landform slope, vegetative bank protection, and cutting	Vegetate and protect banks, repair cut areas.
CC-A Designation	1.0	Tributary to Calhoun Creek from junction with CC-B and CC-C north 1.0 mile	Fair	Fair landform slope, debris jam potential, and vegetative bank protection	Remove potential jam materials, vegetate and protect banks.
CC-C Designation	0.2	Tributary to Calhoun Creek from Bener Rd. southwest 0.2 mile	Fair	Fair landform slope	
CC-G Designation	0.1	Tributary to Calhoun Creek from junction with CC-H northwest to I-43	Fair	Fair vegetative bank protection	Vegetate and protect banks.
UF-F Designation	0.2	Tributary to Poplar Creek from Willow Rd. northwest to New Berlin West High School	Fair	Fair debris jam potential and vegetative bank protection	Remove potential jam materials, vegetate and protect banks.
UF-H Designation	0.2	Tributary to Poplar Creek from junction with UF-L east 0.2 mile	Fair	Fair vegetative bank protection	Vegetate and protect banks.
URR-F Designation	0.2	Tributary to Root River from Cleveland Rd. north 0.2 mile to beginning of concrete lining on northern wall of creek	Fair	Fair vegetative bank protection	Vegetate and protect banks.
URR-F Designation	0.1	Tributary to Root River from Cleveland Rd. southwest to 128th St.	Fair	Fair vegetative bank protection	Vegetate and protect banks.

Table 8-8: Recommended Actions for Stream Reaches with the Most Significant Streambank Stability Concerns

Subwatershed and Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating	Streambank Stability Concern	Recommended Actions
Deer Creek Designation	0.1	From point 0.1 mile north of Glendale Rd. north 0.1 mile	Fair	Fair landform slope, cutting, and deposition	Repair cut areas.
URR-D Designation	0.1	Tributary to Root River from point extending between National Ave. and Cleveland Ave. north 0.1 mile to point extending west of Montana Ave.	Fair	Fair landform slope, vegetative bank protection, obstructions, and cutting	Vegetate and protect banks, remove flow obstructions, repair cut areas.

14.2

usually contain wetlands and floodplains; thus, there will be regulatory requirements and constraints.

Facility construction - Usually, the facility will be constructed using funds collected from developers. However, it will be necessary for the City to acquire the site and begin initial construction using general funds. Also, it will be necessary to oversize upstream conveyance facilities to assure that flows from new developments can reach the regional storage facility.

Design criteria for regional storage areas are established based on the storm water management goals and objectives identified in Section 2 of this report. The regional detention ponds are designed to restrict the 100-year 24-hour peak discharge to the 100-year pre-development flow rate. Sufficient storage capacity will be provided to contain flow in excess of the pre-development 10-year flow.

Four sites located in the Poplar Creek and Tess Corners Creek subwatersheds were evaluated as potential regional detention facility locations. Site RD-1 is located in the Tess Corners Creek subwatershed and sites RD-2, RD-3 and RD-4 are located in the Poplar Creek subwatershed. These detention sites would help prevent future flooding problems due to development and may mitigate flooding problems that already exist.

- Site RD-1 is located just north of College Avenue on the northeast side of Tess Corners Creek. This site will hold 240 acre-feet of water which will reduce the existing landuse 100-year peak flow by 100 cfs and reduce the future conditions peak flow by as much as 300 cfs. The detention facility would have a design depth of about 7 feet and cover an area of 38 to 40 acres.
- Site RD-2 is located just east of Calhoun Road, on the east side of Poplar Creek and south of Coffee Road. This site would be designed to hold 51 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 80 cfs. The detention facility would have a design depth of about 4.4 feet and cover an area of 20 acres.
- Site RD-3 is located on the west side of Poplar Creek, just south of Coffee Road. This site would be designed to hold 200 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 260 cfs. The detention facility would have a design depth of about 7.7 feet and cover an area of 45 acres.
- Site RD-4 is located on the east side of Calhoun Road, just north of Coffee Road. This site would be designed to hold 236 acre-feet of water which will reduce the future conditions 100-year peak flow by as much as 240 cfs. The detention facility would have a design depth of about 5.9 feet and cover an area of 67 acres.

The conceptual design of each detention facility is based on the following:

<Each detention site will be filled and drained by gravity to reduce operation and maintenance costs.

<The inlet will be controlled by a broad crested weir and the outlet will be controlled by an appropriately sized reinforced concrete pipe.

<The sides of the storage sites will have a maximum 3:1 (horizontal:vertical) slope and could utilize terracing to provide areas for trees and shrubs.

<When dry, the sites may be used for parks, athletic fields or other recreational purposes.

<A portion of the bottom area could be excavated to include a small, permanent pond to enhance the aesthetics and increase recreational options.

Additional specific information concerning each site, including conceptual design data, is presented in Tables 8-9 and 8-10. The reduction in flow after implementation of the regional detention sites is presented in Table 8-11.

Table 8-9: Regional Storage Site Drainage Area Characteristics

Site Identification	Site Location	Drainage Area (acres)	Percent Impervious (%)	
			Existing Land Use	Future Land Use
RD-1	Northeast side of Tess Corners Creek, north of College Avenue	1570	8	23
RD-2	East of Calhoun Road, south of Coffee Road	260	6	13
RD-3	West side of Poplar Creek, south of Coffee Road	2152.1	7.6	12.5
RD-4	East of Calhoun Road, north of Coffee Road	372.9	21	35

Table 8-10: Regional Storage Site Conceptual Design Parameters

Site ID	Surface Area of Site (acres)	Max. Depth (feet)	Volume (acre-feet)	Invert Elevation (feet)		Inflow Weir Crest (feet)	Outlet Diameter (inches)	Maximum Outflow (cfs)	Cost
				Inlet	Outlet				
RD-1	38	7	260	NA	820	NA	2@24	70	\$2,651,000
RD-2	20	4.4	51	NA	867.5	NA	18	11.4	\$1,712,130
RD-3	45	7.7	200	867	863	30	6	1	\$8,430,030
RD-4	67	5.93	236	861.5	859	60	18	15	\$41,810

Table 8-11a: Reduction in Flow Resulting from Regional Detention

Location		24-hour Storm Peak Flow (cfs)				100-year Peak Storm Flow for Future Land Use with Regional Detention (cfs)		
		Present		Future				
Node	Street Name	10-year	100-year	10-year	100-year	RD-2	RD-3	RD-4
PA23632	D/S Coffee Road	149	416	173	443	401	197	447
PA21034	U/S Calhoun Road	241	486	282	503	480	429	417
P03490	D/S Arcadian Lane	335	855	436	935	932	928	891

Table 8-11b: Reduction in Stage Resulting from Regional Detention

Location		24-hour Storm Peak Stage (feet)				100-year Peak Storm Stage for Future Land Use with Regional Detention (feet)		
		Present		Future				
Node	Street Name	10-year	100-year	10-year	100-year	RD-2	RD-3	RD-4
PA23632	D/S Coffee Road	865.61	867.03	865.77	867.22	866.98	865.98	867.22
PA21034	U/S Calhoun Road	861.24	864.1	861.79	864.33	864.02	863.52	863.3
P03490	D/S Arcadian Lane	828.22	829.08	828.44	829.18	829.18	829.18	829.13

Additional regional detention sites were recommended in the *Stormwater Management Plan for the Deer Creek Watershed* prepared by Bonestroo Rosene Anderlik & Associated in 1993 and in the *Westridge Stormwater Management Plan* prepared by Ruekert/Mielke in 1995. The sites recommended in these plans were not re-evaluated or analyzed as part of the preparation of this plan. Information related to the sites recommended is presented in Section 9.

Section 9

Recommended Storm Water Management Plan

9.1 Option Selection

Section 8 of this Storm Water Management Master Plan presents several options to improve the storm water drainage and storm water quality for the City of New Berlin. The options considered and described present a range of effectiveness, as well as a range of cost. The recommended storm water management plan includes the options which are selected for implementation.

The recommended storm water management plan consists of three major elements;

- storm water drainage and flood control,
- water quality improvement, and
- urban land development.

A variety of structural and non-structural measures have been selected for implementation which will effectively and efficiently meet the goals and objectives of this plan, reduce flooding and drainage problems, and improve the quality of storm water runoff. The plan requires an effective operation and maintenance plan and a drainage concern response strategy. The selected storm water management plan is also based on the adoption and enforcement of a comprehensive storm water ordinance. Lack of the enforcement of the storm water ordinance or lack of implementation of the operation and maintenance plan will greatly reduce the effectiveness of the recommended plan and its ability to meet the stated and accepted goals and objectives presented in Section 2. The recommended plan is described in the following sections of this report and is shown on Plate 2 in Appendix A.

9.2 Storm Water Drainage and Flood Control Plan

9.2.1 Primary Flooding Problems

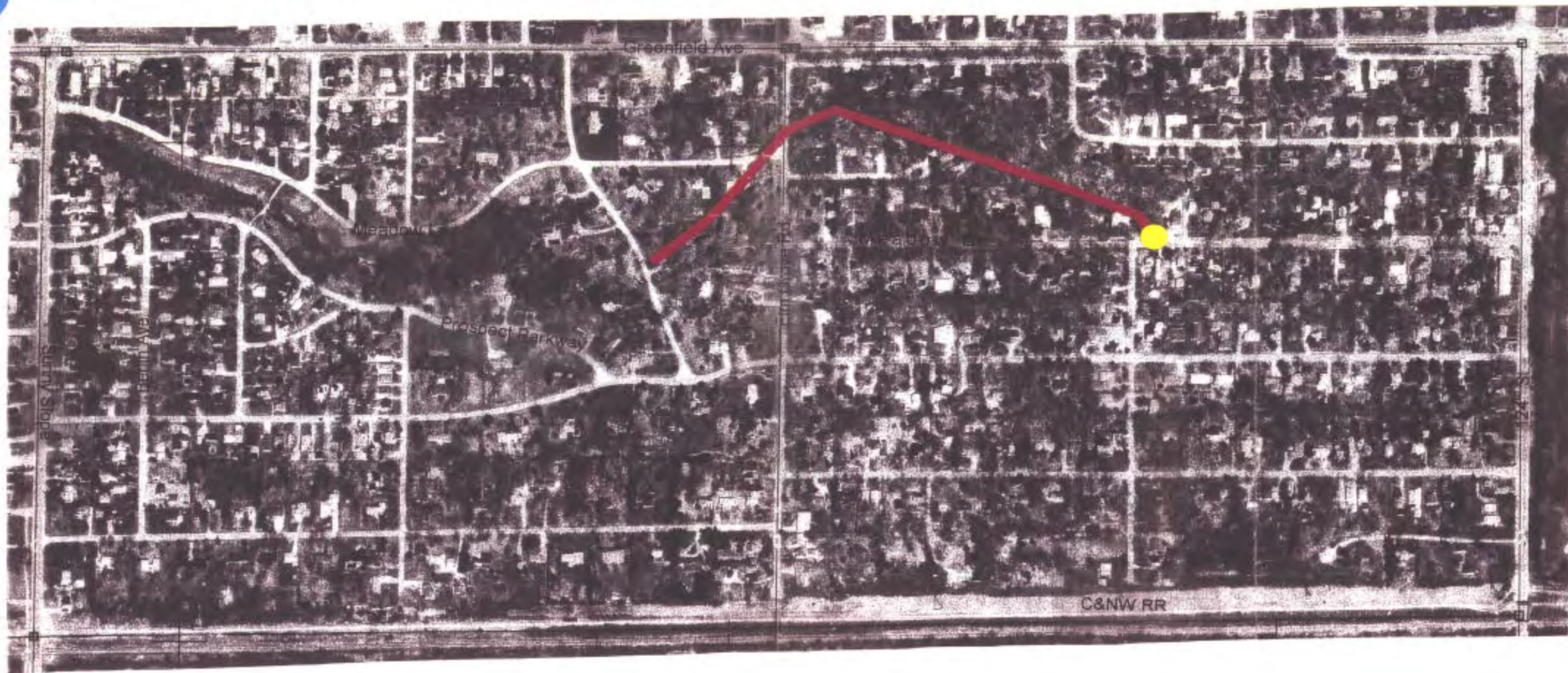
The storm water drainage and flood control options evaluated include detention/storage measures or hydraulic system improvements which mitigate storm water drainage and flooding problems. The selected storm water drainage and flood control plan will provide a balance between protection against structural flooding in the 100-year storm event and public expenditure of funds.

The recommended flood control projects are presented in Table 9-1. The recommended flood control projects, including detention basin and channel improvement locations, are shown on Figures 9-1 through 9-7.



STORAGE FACILITY IN BROOKFIELD
IMPLEMENTED IN UNDERWOOD 2a OPTION

Figure 9-1
PROBLEM AREA UNDERWOOD 1 & 2a:
*Underwood Creek at Meadow Lane &
Underwood Creek near Elm Grove Road*



AREA OF CONCERN NOTED BY THE CITY OF NEW BERLIN	
STORM SEWER ENTRANCE IMPROVEMENTS	
STORAGE FACILITY IN BROOKFIELD	

1995 ORTHOGRAPH OF
TOWNSHIP 6 NORTH, RANGE 20 EAST, SECTION 1
STORM WATER MANAGEMENT MASTER PLAN
CITY OF NEW BERLIN, WAUKESHA COUNTY

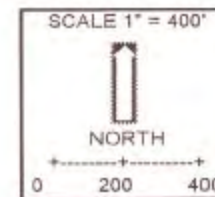


Figure 9-2

PROBLEM AREA UNDERWOOD 2b: Gatewood Park

STORAGE FACILITY IN BROOKFIELD
IMPLEMENTED IN UNDERWOOD 2a OPTION



REGION OF CONCERN NOTED BY THE CITY OF NEW BERLIN	
NEW STORM SEWER ADDITION	
STORAGE FACILITY IN BROOKFIELD	

1995 ORTHOGRAPH OF
TOWNSHIP 6 NORTH, RANGE 20 EAST SECTIONS 1&2
STORM WATER MANAGEMENT MASTER PLAN
CITY OF NEW BERLIN, WAUKESHA COUNTY

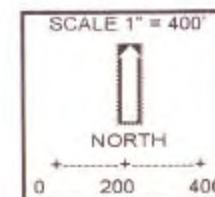


Figure 9-3

**PROBLEM AREA ROOT 1: Upper Root River -
130th Block of Park Avenue**



NEW CULVERT INSTALLATION	
CHANNEL EXPANSION	

1995 ORTHOGRAPH OF
TOWNSHIP 6 NORTH, RANGE 20 EAST SECTION 1
STORM WATER MANAGEMENT MASTER PLAN
CITY OF NEW BERLIN, WAUKESHA COUNTY

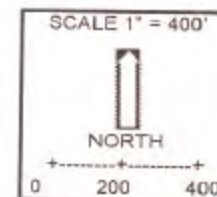


Figure 9-4
**PROBLEM AREA ROOT 2: Upper Root River -
 132nd Street to Lagoon Road along Cleveland Avenue**



1995 ORTHOGRAPH OF
 TOWNSHIP 6 NORTH, RANGE 20 EAST, SECTION 12
 STORM WATER MANAGEMENT MASTER PLAN
 CITY OF NEW BERLIN, WAUKESHA COUNTY

FLOODING STREAMBANK	
ON-LINE DETENTION STORAGE	
FLOOD PLAIN LOWERING	

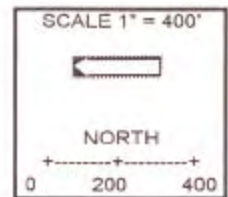
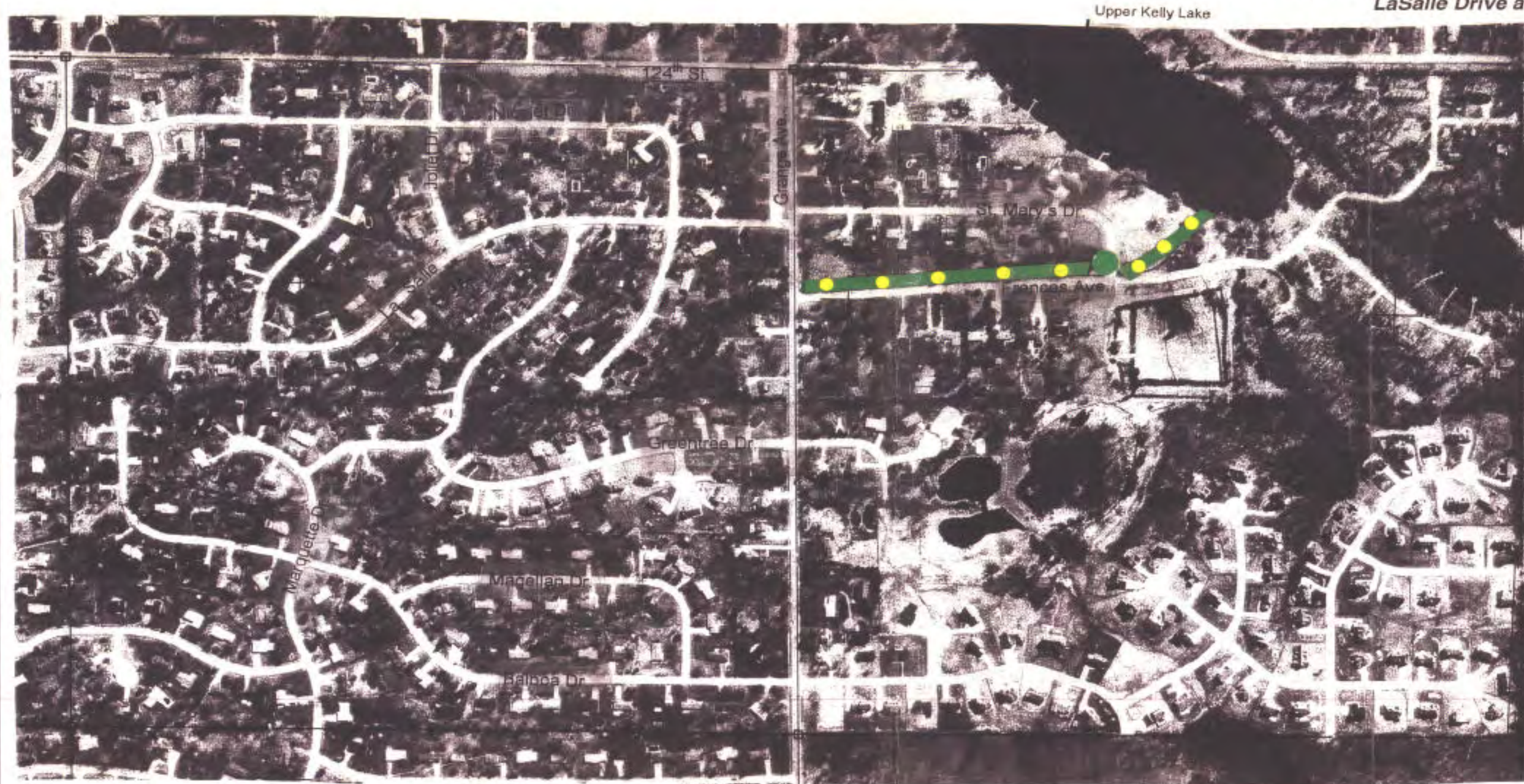


Figure 9-5
**PROBLEM AREA ROOT 3: Upper Root River -
 LaSalle Drive and Grange Ave.**



1995 ORTHOGRAPH OF
 TOWNSHIP 6 NORTH, RANGE 20 EAST, SECTIONS 25 & 36
 STORM WATER MANAGEMENT MASTER PLAN
 CITY OF NEW BERLIN, WAUKESHA COUNTY

Figure 9-6

PROBLEM AREA ROOT 4: Upper Root River - Honey Lane



YARD FLOODING	
DITCH REGRADING	

1995 ORTHOGRAPH OF
TOWNSHIP 6 NORTH, RANGE 20 EAST SECTIONS 1&2
STORM WATER MANAGEMENT MASTER PLAN
CITY OF NEW BERLIN, WAUKESHA COUNTY

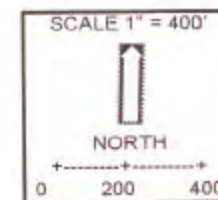
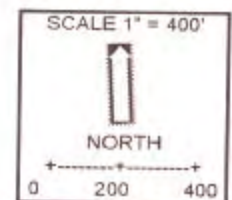


Figure 9-7
PROBLEM AREA DEER 1: Buena Park



AREA OF CONCERN NOTED BY THE CITY OF NEW BERLIN	
DITCH RECONSTRUCTION	

1995 ORTHOGRAPH OF
TOWNSHIP 6 NORTH, RANGE 20 EAST, SECTION 3
STORM WATER MANAGEMENT MASTER PLAN
CITY OF NEW BERLIN, WAUKESHA COUNTY



The selected alternatives generally meet Objective No. 2 by providing storm water drainage and flood control facilities which prevent flood damages to property, prevent health and safety hazards, and prevent drainage -related nuisance and inconvenience at the most effective cost. The selected alternatives will provide a level of protection against the 100-year storm in most of the problem areas identified.

Table 9-1: Selected Drainage and Flood Control Plan

Problem Number	Problem Summary	Selected Alternative	Level of Protection
UNDERWOOD 1 (see Figure 9-1)	Along Meadow Lane between 128th and 124th Sts. The South Branch of Underwood Creek is enclosed in a storm sewer. Overflow of the box culvert entrance at 124th St. and Meadow Lane floods basements and backyards. There are numerous reports of house yard and street flooding associated with this enclosed channel.	Reduce flow with upstream storage recommended as part of UNDERWOOD 2a, increase conveyance capacity of the storm sewer entrance, including a sloped trash rack which is less susceptible to debris clogging.	100 year
UNDERWOOD 2a (see Figure 9-1)	Overbank flooding of yards and homes along the South Branch of Underwood Creek beginning about 500 feet upstream of Arcadian Drive. Flooding southwest of the intersection of Elm Grove and Meadow Lanes.	30 acre-foot storage facility located north of Greenfield Avenue in the City of Brookfield. Also provides necessary storage for Problem UNDERWOOD 1.	100 year
UNDERWOOD 2B (see Figure 9-2)	Yard, street, and basement flooding in the Gatewood Park neighborhood.	Additional 60-inch storm sewer to serve Gatewood Park area. Lower floodplain south of Grange Avenue.	25 year ¹
ROOT 1 (see Figure 9-3)	One residence experiences flooding along Park Avenue near Elm Grove Road. Yard flooding and erosion in backyards on the north side of Park Avenue.	Installation of new culvert at Graham St. and channel expansion between Graham St. and Elm Grove Road.	25 year ¹
ROOT 2 (see Figure 9-4)	15 homes are within the floodplain in the area bounded by Cleveland avenue, national avenue, 124th Street, and 132nd Street. Road flooding on Lagoon Road north of Cleveland Avenue. Washout of private bridge at 128th Street and Cleveland Ave.	Online detention storage at four locations in the area and floodplain lowering.	100 year
ROOT 3 (see Figure 9-5)	House flooding upstream of Grange Avenue near Francis Avenue.	Replace culverts at St. Mary=s Drive and lower floodplain south of Grange Avenue.	100 year
ROOT 4 (see Figure 9-6)	Yard flooding and erosion near Honey Lane and Elm Grove Road. Flooding of one residence and several yards east of the intersection at Elm Grove and Honey Lane.	Regrade roadside and railroad ditches in the area.	10 year ¹
DEER 1	Six residence experience structural flooding along 168th St. in the Buena Park	Reconstruct ditches with some segments of storm sewer from Fullerton	10 year ¹

Problem Number	Problem Summary	Selected Alternative	Level of Protection
(see Figure 9-7)	neighborhood south of Greenfield Avenue. The flooding is caused by inadequate drainage. Sump pumps discharge to the drainage ditch and lawn clipping and yard waste contribute to culvert blockage.	to Roosevelt. Also redirect sump pumps to lawn areas rather than direct discharge to the drainage ditches. Clean debris from ditches and culverts	

Notes:¹ an alternative to achieve 100-year level of protection was not considered economically feasible.

9.2.2 Culvert Replacement Program

In order to reduce localized flooding problems, culverts which are considered undersized are selected for replacement. The culvert replacement program includes 32 primary culverts which either cause road overtopping in excess of 6-inches in the 100-year storm; cause overtopping of a main arterial in the 100-year storm; or which do not provide sufficient capacity for the 100-year storm. The culvert replacement program also includes 83 secondary culverts which do not have sufficient capacity for the 10-year recurrence interval storm event. The culverts in the primary and secondary storm water management system that are designated for replacement are listed in Table 7-2 and 7-3, respectively.

9.2.3 Drainage Ditch Improvements

In order to improve the efficiency of the drainage ditch system, the drainage ditch problem areas identified in Section 7.4, listed in Table 7-4, should be repaired. Repair of the ditch areas will include erosion protection, restabilization, clearing of sedimentation, and collection of accumulated debris.

9.3 Storm Water Quality Improvement Plan

The storm water quality alternatives evaluated include pollution source control measures and pollution treatment measures. A combination of treatment and source control measures are selected to meet the objectives and criteria presented in Section 2. The selected source control and treatment control measures are presented in Table 9-2.

Table 9-2: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
Source Control Measures			
Develop in Accordance with	The change from existing to future land use, based on the zoning map.	sediment 12% phosphorous 6%	As new areas are developed the land use will transform from agricultural to

Table 9-2: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
the Zoning Map		lead -34%	urban land uses. Sediment and phosphorous loading will be reduced. However, due to the more urban land use, the metals loading is expected to increase.
Adopt and enforce storm water ordinance	The draft storm water ordinance requires new development to provide storm water quality improvement.	sediment 9% phosphorous 5% lead 14%	The storage and water quality requirements will be essential in eliminating new flooding or water quality problems caused by urban development.
Industrial Best Management Practices	Industries regulated by NR216 are required to implement best management practices. Additionally industries which are potential significant pollutant contributors should implement applicable suggested best management practices.	sediment 4% phosphorous 0.3% lead 3%	To ensure we achieve the estimated pollutant reduction, routine monitoring/reporting may be necessary.
Roadway Pavement Sweeping	Arterials and Industrial Park Area: Seasonal sweeping program (weekly from April through May, bi-weekly June through August, monthly from September through November and during March)	sediment 1% phosphorous 0.5% lead 3%	--
Ice Management Practices	implement improved salt distribution methods, train personnel involved with salt distribution	variable	Ice management should involve a policy decision on the part of the common council regarding the frequency, level, extent of deicing.
Catch Basin Cleaning / Retrofit	Clean catch basins twice per year / install catch basins in new development or redeveloping areas which will be serviced by storm sewer.	sediment 0.04 tons/acre drained lead 0.05 lbs./ acre drained	--
Landscape	Implement environmentally friendly landscape practices in institutional	sediment 0.4% phosphorous 2%	Examples of environmentally friendly practices include increased turf

Table 9-2: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
Practices	yards, park areas, school yards, city building yards, and vegetated median strips.	lead 2%	height, reduced week control, replacement of turf with low maintenance ground cover or perennials, and reduced fertilized application.
Snow Storage Practices	Locate snow storage areas in a well vegetated area at least 200 feet from a drainage way or storm sewer inlet	variable	Implementation of this practice provides the snow melt an opportunity to filter though the vegetated area which will remove a portion of the pollutant loading.
Erosion Control Ordinance	Increase the construction site inspection program, and train inspectors on erosion control techniques.	Variable	--
Agricultural Practices	Encourage use of Agricultural BMPs such as conservation tillage and adopt a shoreline management ordinance.	sediment 6.5% phosphorous 7% lead 0.1%	County may be primarily responsible for implementation of agricultural practices.
Streambank Stabilization	Stabilize key streambanks as identified in Section 7	variable	streambank stabilization measures may include: vegetation, erosion protection, and debris removal is designated areas.
Public Education and Information Program	Provide information to the general public and industries on the Storm Water Management Plan	variable	Topics may include: Lawn care, pet waste handling, other best management practices, as well as the NR216 requirements. May utilize newsletters, newspaper articles, school programs, cable TV and use of preprinted materials and videos.
Treatment Measures			
Water Quality Detention Basin	Construct a water quality detention basin west of Kelly Lake	sediment 2% phosphorous 1.5% lead 3%	--
Retrofit Wetland	Retrofit three prior converted wetlands into storm water treatment wetlands	sediment 2% phosphorous 3%	

Table 9-2: Selected Water Quality Control Measures

Source Control Measure	Description	Estimated Reduction of Total Annual Load	Comments
	for highway runoff. Locations: north of I-43 west of Calhoun, north of I-43 west of Moorland, south of I-43 east of Moorland	lead 15%	
Retrofit Wetland	Retrofit one prior converted wetland within Basin 5A020 south of National Avenue east of Moorland	sediment 1% phosphorous 1% lead 0.5%	Will collect runoff from agricultural and residential land use areas.
Retrofit Wetland	Retrofit one prior converted wetland within Basin 3A060 north of College west of Sunny Slope east of Small	sediment 0.2% phosphorous 0.1% lead 0.9%	Will collect runoff from commercial land use area.

The recommended options will result in the following approximate reductions in the existing total annual pollutant loadings from the study area: sediment 37 percent, phosphorous 26 percent, and lead 7 percent. Additional pollutant reductions will be provided for storm water management controls with variable pollutant reduction levels such as public information and education and increased erosion control inspections.

The selected plan will result in a significant reduction in pollutant loadings to the Root, Upper Fox, and Menomonee Rivers and Muskego - Wind Lakes. However, the reduction criteria presented in the Non-point Source Control Plan for the Priority Watersheds will not be met. The recommended level of pollutant reduction in the Non-point Source Control Plans is 50 to 75 percent for sediment, 30 to 70 percent for nutrients, and 40 to 53 percent for toxics, such as lead. The pollutant reduction goal is very difficult to achieve.

9.4 Regional Storage Opportunities

The regional storage options evaluated should be considered to mitigate the cumulative impacts of the existing and future development in an area. Impediments to implementation of regional storage include acquisition of land and the costs of construction and maintenance. Four regional detention areas, located in the Tess Corners Creek and Poplar Creek subwatersheds, were evaluated as part of this plan. Three of the sites are considered practical for implementation based on cost and effectiveness in flow reduction. The fourth site, (RD-2) served a relatively small drainage area and the site contained significant large wetland areas. It was determined that site RD-2 would not be an effective regional detention site and would be very costly to develop. The practical sites are listed below:

- RD-1, 40 acre site in the Tess Corners Creek watershed near Sunny Slope and College.
- RD-3, 200 acre site near Coffee Road and Calhoun Road.
- RD-4, 236 acre site located South of the Industrial Park South of Cleveland Avenue along Calhoun Road.

Additional information related to the regional detention sites is presented in Table 9-3.

Implementation of these regional storage areas should be evaluated on a case-by-case basis as development is anticipated to occur in the drainage areas. Each of these sites contains some wetland and floodplain areas which may affect their feasibility and development cost. The impact of these and other regulatory issues including endangered species and archaeological resources has not been investigated.

Regional storage areas recommended in the *Stormwater Management Plan for the Deer Creek Watershed* (Bonestroo Rosene Anderlik & Associates, 1993) and in the *Westridge Stormwater Management Plan* (Ruekert/Mielke 1995) should also be considered for implementation. Information related to the regional storage sites recommended in these storm water management plans is presented in Table 9-3. The location of the ponds is shown on the maps presented in Appendix J. The related storm water management plan should be referred to for more detailed information.

Table 9-3: Regional Detention Areas

Site Identification	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost	Annual Operations and Maintenance Cost
RD-1	Northeast side of Tess Corners Creek, west of Sunny Slope Rd.	1,570	260	\$2,651,000 ¹	
RD-3	West side of Poplar Creek, south of Coffee Rd.	2,150	200	\$8,430,030 ¹	
RD-4	East of Calhoun Rd., north of Coffee Rd.	2,520	236	\$13,504,870 ¹	
Regional ponds recommended in the Stormwater Management Plan for the Deer Creek Subwatershed prepared by Bonestroo Rosene Anderlick & Associates ²					
NP-1	NW & NE1/4 of Section 3	not available	1,64.3	\$971,000	not available
CP-1	NW1/4 of Section 11	not available	0.3	not available	not available
CP-2	NW1/4 of Section 11	not available	11.9	not available	not available
CP-3	NE1/4 of Section 10	not available	24.1	not available	not available
CP-4	SW1/4 of Section 3	not available	9.9	\$244,000	not available
CP-5	SW1/4 of Section 3	not available	10.3	\$171,000	not available
CP-6	SW1/4 of Section 3	not available	45.8	\$180,000	not available
CP-7	SE1/4 of Section 3	not available	50.5	not available	not available
CR-2		not available	not available	\$10,000	not available
CR-3		not available	not available	\$26,000	not available
SCP-1	SW1/4 of Section 11	not available	0.4	\$74,000	not available
SCP-2	SW1/4 of Section 11	not available	2.2	\$24,000	not available
SCP-3	SW1/4 of Section 11	not available	1.2	\$37,000	not available

Table 9-3: Regional Detention Areas

Site Identification	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost	Annual Operations and Maintenance Cost
SCP-4	SW1/4 of Section 11	not available	5.3	\$144,000	not available
SCP-5	SW1/4 of Section 11	not available	4.8	not available	not available
SCP-6	SW1/4 of Section 11	not available	34.9	\$466,000	not available
SCP-7	SE1/4 of Section 10	not available	5.4	\$32,000	not available
SCP-8	SE1/4 of Section 10	not available	8.8	\$50,000	not available
CR-1	SE1/4 of Section 10	not available	25.1	\$10,000	not available
SP-1	SW1/4 of Section 23	not available	11.2	\$4,000	not available
SP-2	N1/2 of Section 23 & S1/2 of Section 14	not available	90.9	\$516,000	not available
SP-3	SW1/4 of Section 14	not available	10.3	\$41,000	not available
SP-4	SE1/4 of Section 14	not available	13	\$54,000	not available
SP-5	SW1/4 of Section 14	not available	4.4	\$535,000	not available
CR-4	Section 11,14,&23	not available	7.5	\$26,000	not available
Regional ponds recommended in the Westridge Stormwater Management Plan prepared by Ruekert/Mielke ²					
G3	NE1/4 of Section 34	not available	18.5	not available	not available
H1/2	SW1/4 of Section 23	58.5	3.61	not available	not available
H1/4	NW1/4 of Section 26	68	6.92	not available	not available
	NW1/4 of Section 26	90.4	3.34	not available	not available

Table 9-3: Regional Detention Areas

Site Identification	Location	Approximate Drainage Area (acres)	Volume (acre-feet)	Capital Cost	Annual Operations and Maintenance Cost
H1/5					
H1/6	NE1/4 of Section 27	27.9	3.54	not available	not available
H2/1	SE1/4 of Section 27	87.6	5.01	not available	not available
H2/3	SW1/4 of Section 26	not available	3.00	not available	not available
H3/2	NE1/4 of Section 27	not available	7.08	not available	not available
H3/3	SW1/4 of Section 27	not available	13.32	not available	not available
H3/4	NE1/4 of Section 27	not available	3.10	not available	not available

Notes:

1 - These costs are for planning purposes only and do not include land acquisition, construction site erosion control, unknown environmental constraints, legal fees, or utility relocation costs which may be associated with the plan.

2- The recommendations presented in reports prepared by others were analyzed as part of this plan. The costs listed in this table have not been updated. The plans should be referred to for additional information.

9.5 Urban Land Development Guidelines

The stream corridor is a measure of the health of a watershed. Highly urbanized areas impact the stream with major changes in the way storm water runoff functions. Peak discharge becomes higher and faster and low flow becomes lower and more erosive. Bridges and culverts create backwater effects and leave sedimentation blockage at the upstream side. Water quality and habitat are extensively degraded. Figure 9-8 shows the effect of urbanization. Guidelines for development are necessary to reclaim or prevent stream impacts.

Imperviousness is directly related to both quantity and quality of storm water runoff. A very low percent increase in roads, parking lots, and rooftops has been shown to effect streams - even as low as 10 to 20%. The challenge is to effectively plan the gradual development process at the local level. New Berlin is located at the high points of five watersheds. The smallest network of the watershed begins at the high point. The headwater streams at this local level have a regional impact. The following guidelines are described to mitigate the impacts of urban growth expected in the City of New Berlin and protect the headwater streams.

- Establishing site grading requirements and zoning restrictions
- Requiring buffer zones or green spaces along streams
- Establishing building setbacks distances from streams
- Defining allowable peak rates and volumes of discharge
- Protecting wetlands and other sensitive areas
- Providing water quality improvement
- Implement operations and maintenance activities

All of the guidelines are essential to minimize the creation of new flooding problems or further degradation of water quality because of new development. Under separate cover, a land development guideline manual has been developed to serve as a companion document to the storm water ordinance, as well as this plan. The manual is tailored to each subwatershed. The document is intended to be a tool a developer and the City will use as the City of New Berlin develops.

9.6 Cost Estimate for the Recommended Plan

The total capital cost for the recommended Plan is estimated to be \$4,681,000. A summary of the estimated costs for the selected plan elements is presented in Table 9-4. The costs associated with the storm water management ordinance compliance will be paid by developers, not by the City of New Berlin or the WDNR. Also, the costs associated with industrial BMP=s will be incurred by industry.

Urbanization Impacts on Streams

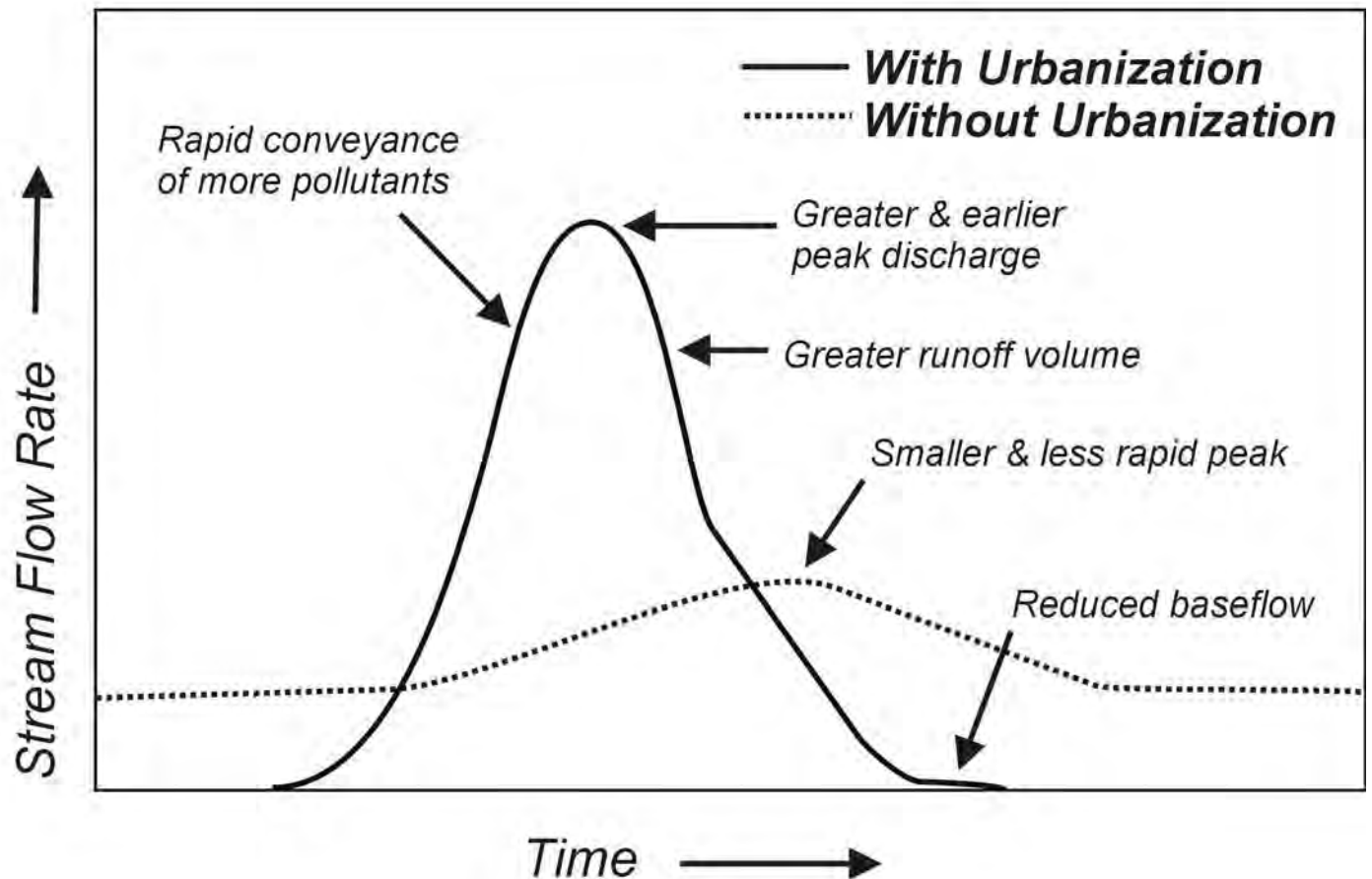


Figure 9-8

Table 9-4: Recommended Plan and Estimated Costs

Plan Component	City of New Berlin		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
Drainage / Flood Control Plan						
UNDERWOOD 1: increased conveyance capacity at storm sewer entrance	\$50,000-100,000	\$8,000	--	--	\$50,000-\$100,000	\$8,000
UNDERWOOD 2a: 30 acre-foot storage facility North of Greenfield in the City of Brookfield.	\$790,000	\$10,000	--	--	\$790,000	\$10,000
UNDERWOOD 2b: Additional 60-inch storm sewer to serve Gatewood Park area	\$400,000	\$1,000			\$400,000	\$1,000
ROOT 1: Installation of new culvert at Graham St. and channel expansion between Graham and Elm Grove Road.	\$101,000	\$1,000	--	--	\$101,000	\$1,000
ROOT 2: Online detention storage at four locations	\$2,500,000	\$10,000	--	--	\$2,500,000	\$10,000
ROOT 3: Replace culverts at St. Mary's Drive and lower floodplain south of Grange Ave.	\$350,000	\$1,000	--	--	\$350,000	\$1,000
ROOT 4: Regrade roadside and railroad ditches	\$30,000	--	--	--	\$30,000	--
DEER 1: Reconstruct ditches with segments of storm sewer from Fullerton to Roosevelt and redirect sump pump discharge to lawn areas.	\$180,000	\$2,000	Cost to home owners for redirection of sump pumps	--	\$180,000	\$2,000
Minor System Flooding Problems	To Be Determined	--	--	--	To Be Determined	--

Table 9-4: Recommended Plan and Estimated Costs

Plan Component	City of New Berlin		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
Culvert Replacement and Ditch Repair Program (no water quality benefits)						
Replace/repair culverts	--	\$50,000/yr	--	--	--	\$50,000/yr
Repair Ditch	--	\$25,000/yr	--	--	--	\$25,000/yr
Water Quality Improvement Plan						
Implement Zoning Plan	--	--	--	--	--	--
Implement and enforce storm water ordinance / erosion control ordinance / shoreland ordinance	--	\$10,000/yr	--	--	--	\$10,000/yr
Industrial Best Management Practices and Extractive Land Use BMP's	--	--	cost will vary by industry/ cost paid by industry	cost will vary by industry/ cost paid by industry	--	--
Roadway Pavement Sweeping	--	\$125,000/yr	--	--	--	\$125,000/yr
Ice Management Practices	Variable		--	--	Variable	
Catch Basin Cleaning	\$5,000 per new catch basin installed	\$70/yr./catch basin cleaned (assumed 200 basins cleaned/yr. for cost	--	--	\$5,000 per new catch basin installed	\$70/yr./catch basin cleaned (assumed 200 basins cleaned/yr. for cost estimate)

Table 9-4: Recommended Plan and Estimated Costs

Plan Component	City of New Berlin		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
		<i>estimate)</i>				
Landscape Practices	Variable		--	--	Variable	
Snow Storage Practices	Variable		--	--	Variable	
Agricultural Practices	Variable				Variable	
Streambank Stabilization	--	\$250,000/yr	--	--	--	\$250,000/yr
Public Education and Information Program	Variable		--	--	Variable	
Wet Detention Pond (Upper Kelly Lake)	to be determined	to be determined	--	--	to be determined	to be determined
Retrofit prior converted wetlands along I-43 (4.5 acre-feet)	\$75,000	\$10,000	possible cost share opportunity with WDOT	--	\$75,000	\$10,000
Retrofit prior converted wetland in basin 5A020 south of Grange Avenue, west of Sunny Slope Road (11 acre-feet)	\$165,000	\$10,000	--	--	\$165,000	\$10,000
Retrofit prior convert wetland in basin 3A060 east of Moorland Road, south of National Avenue (1 acre-foot)	\$15,000	\$10,000	--	--	\$15,000	\$10,000
Regulatory/Ordinance Program						
Compliance with the new ordinance*	--	--	costs will be incurred by	--	--	--

Table 9-4: Recommended Plan and Estimated Costs

Plan Component	City of New Berlin		Developers or Other		Total	
	Capital	Annual O& M	Capital	Annual O& M	Capital	Annual O& M
			developers			
<i>Drainage/ Flood Control Plan</i>	\$4,426,000	\$108,000/yr	--	--	\$4,426,000	\$108,000/yr
<i>Culvert Replacement with Ditch Repair Program</i>	--	\$200,000/yr	--	--	--	\$200,000/yr
<i>Water Quality Improvement Plan</i>	\$255,000*	\$429,000/yr	--	--	\$255,000	\$429,000/yr
<i>Regulatory / Ordinance Plan</i>	--	--	--	--	--	--
TOTAL	\$4,681,000	\$537,000/yr	--	--	\$4,681,000	\$537,000/yr

Notes: These costs are for planning purposes only and do not include land acquisition, construction site erosion control unknown environmental constraints, legal fees, or utility relocation costs which may be associated with the plan. The cost of regional facilities is not included.

** the cost for new catch basins not included in the capital cost.*

9.7 Operations and Maintenance Program

The operations and maintenance (O&M) plan will provide the City with a means of addressing both the short and long term maintenance needs of its open channels, culverts, and detention facilities. Specifically, the program will identify needed maintenance activities and procedures, establish a schedule for maintaining individual system components, and define program management needs including costs and staffing. The prioritization of O&M activities for this project are divided into three levels of service based upon corrective, preventative, and aesthetic maintenance. The O&M activities are in Appendix H. A brief description of the O&M for each of these types of prioritization's is provided below:

9.7.1 Corrective Maintenance

Corrective Maintenance is performed on an emergency or as-needed basis when the integrity of a storm water drainage system is compromised. The focus of this type of maintenance is to protect the public health by repairing damages which threaten existing infrastructure or damage species and habitat. Corrective maintenance program for the City's open channels, culverts, and detention facilities is provided in Appendix H.

9.7.2 Preventative Maintenance

Preventative maintenance is performed on a routine basis in order to ensure the proper operation of the Storm water drainage system. The intent of this type of maintenance is to continually retain the flow carrying capability of the Storm water drainage system. Preventative maintenance program for the City's open channels, culverts, and detention facilities is provided in Appendix H.

9.7.3 Aesthetic Maintenance

Aesthetic maintenance is performed on a routine basis to enhance the appearance and appeal of the storm water drainage system. The goal of this type of maintenance is to provide the public with storm water facilities and components that enhance the community atmosphere. Aesthetic maintenance program for the City's open channels, culverts, and detention facilities is provided in Appendix H.

9.7.4 Monitoring and Training Program

The adoption of a monitoring program is vital for insuring that the existing Storm water drainage system operates efficiently. As part of the monitoring program, a series of inspection forms can be used to identify areas within the drainage system to be monitored during each site visit. The benefit of utilizing such forms allows the City to compile a historical record of the Storm water drainage system, ensure a consistent means of gathering needed information, provide verification that the inspection was done routinely and proficiently, and identify areas where maintenance activities are needed and establish a schedule for their completion. A copy of inspection forms for stream evaluation, drainage swale inventory, storm water management ponds, storm water culverts, storm water open channels, storm water

drainage swales, and storm water infiltration facilities forms are provided in Appendix H.

The frequency for performing the inspections is between 1-2 times per year and after the occurrence of major storm events. A program could be set up by section as the City is conveniently located primarily within one township and range. One full time staff inspector is necessary to monitor approximately 1400 culverts (non-driveway), 34 miles of streams, and an extensive open channel ditch system.

To reduce the potential for improper inspection and maintenance, an inspector training and certification program should be implemented along with the monitoring program. By initializing such programs, the City benefits in two ways. First, by sending inspectors through the program, they become aware of the components, functions, and safety issues concerning each type of storm water drainage system. Second, by educating the inspectors about what to look for, they are able to identify potential problems before they escalate into more serious issues.

9.7.5 Drainage Concern Response Strategy

Resident complaints and concerns about drainage or pollution problems are important. A drainage investigation form has been developed to assist in establishing a reasonable response strategy. The first section is documented by clerical staff as the problem is called in. The second section is completed by the inspection staff which compiles the inventory needed to make decisions. The drainage problem type can be a prioritization mechanism for the maintenance action. The drainage investigation form is located in Appendix I.

9.7.6 Regulatory and Permit Issues

The WDNR provides regulatory review and permit approval on streams and creeks deemed navigable. Prior to any maintenance activity on navigable streams, proper regulatory approvals must be obtained. The WDNR has committed to identifying all navigable streams within the City of New Berlin by the end of 1999. (Greg Breese - WDNR; 229-0821) This will assist the corrective and preventative maintenance activities by knowing when regulatory permits are necessary.

9.7.7 Overall Maintenance Costs

For wet and dry detention ponds, the estimate of the annual maintenance costs (estimated at 3 times the surface area of the pond) range between \$600-\$1000 per maintained acre which includes the pond and surrounding buffer. Several ways to reduce costs include the management of the buffer zone as a meadow rather than a lawn, provide (if possible) on-site disposal, and provide a maintained access way to the facility at a minimum width of 10 feet.

A review of several wet pond dredging operations estimated a range in cost between \$6.25 to \$22.40 per cubic yard and an average dredging cost of \$14 per cubic yard. This cost is based upon factors including size, accessibility, proximity to disposal site, and the method used to remove and transport the sediment. Costs associated for

smaller ponds (<100,000 cf) range between \$5 and \$10 per cubic yard. If hauling or landfilling is required the costs climb even higher by \$5 to \$10 per cubic yard and \$15 to \$20 per cubic yard respectively.

For dry detention ponds, the removal cost for cleaning will be lower than that of wet ponds. Actual costs for dry detention ponds range between \$5 and \$10 per cubic yard (1987 dollars). This is due to the elimination of dewatering, drag-line, and hydraulic dredging techniques needed for wet pond clean up. If hauling or landfilling is needed, the same unit costs apply as those found from wet detention ponds.

For open channels, the following costs are associated with operations and maintenance. Labor rates were estimated at \$17 per hour; equipment costs at \$200 per day; overhead and administrative costs at 3x raw labor; streambank repair and erosion control at \$75 per linear foot; and plant replacement at \$15 per plant.

For detention basins, the following costs as above for open channels with the addition of slope repair which was estimated at a lump sum of between \$1,000 and \$3,000 per year.

9.8 Storm Water Management Ordinance

The storm water management goals and objectives outlined in Section 2 require preventative actions be taken during land development activities. New development of land has a significant impact on storm water runoff and on storm water quality. A regulatory tool that can minimize that impact is a storm water ordinance. The intent of an ordinance would be to maintain, as nearly as possible, the pre-developed runoff characteristics, and to reduce storm water pollution. The ordinance would prevent new flooding and reduce stream erosion, siltation, and sedimentation. The WDNR has prepared a model storm water ordinance for voluntary local adoption. The Waukesha County Board adopted a revision of the model ordinance on March 24, 1998. The Waukesha County Stormwater Management Ordinance was developed by a Stormwater Advisory Committee and applies to unincorporated land in Waukesha County - not the City of New Berlin. Revisions to the current WDNR model storm water management ordinance are recommended and have been compared to the Waukesha County ordinance. Muskego, Menomonee Falls, and Germantown all have a similar over-detention water quantity policy. The recommended ordinance revisions include the following:

- The administering authority shall be the City of New Berlin Engineer.
- The applicability criteria shall apply to all land development activities greater than one acre.
- Other acceptable hydrologic and hydraulic design methods may include US EPA SWMM, US Army Corps HEC-1, or other approved methods.
- The maintenance of the storm water practices shall be the responsibility of the City of New Berlin.

- The 100-year, 24 hour peak rate of runoff after the proposed activities may not exceed the peak rate of runoff which would have resulted from the 10-year, 24 hour event occurring over the site with the land in pre-settlement state, with the pre-settlement state curve number being not greater than 77 for hydrologic soil group D, not greater than 70 for hydrologic soil group C, not greater than 55 for hydrologic soil group B, and not greater than 30 for hydrologic soil group A.
- Where on site detention is required for runoff control, the detention facilities shall safely contain and/or safely pass the runoff of a 100-year storm event of any duration through a v-notch weir control structure as practicable.
- An active storage volume equal to the runoff volume under developed condition from the 1-year, 24 hour event shall be created unless other storm water treatment practices are used. The active storage volume shall be discharged over the first 24 hours of the storm event or greater and that discharge control structure shall be submerged.

Design and specification shall be based on established and accepted procedures, and/or must conform to the standards set forth by the City Engineer. Any deviation from accepted procedures must be approved.

Section 10

Plan Implementation

This Storm Water Management Plan prepared for the City of New Berlin is designed to practically achieve the objectives and criteria presented in Section 2.

Implementation of the plan will require a long term commitment by the City of New Berlin, matched with a high level of cooperation with the WDNR, developers, businesses, industries, schools, and private property owners. Implementation of this plan should be coordinated with the WDNR's Non-point Source Control Plan for the Menomonee River Priority Watershed Project, the Non-point Source Control Plan for the Upper Fox River Watershed Project, the Non-point Source Control Plan for the Root River, the Non-point Source Control Plan for the Muskego - Wind Lakes Watershed Project.

10.1 Prioritization and Implementation of Plan Components

The plan consists of three major elements: storm water drainage and flood control, storm water quality improvement, and urban land development guidelines. The elements include non-structural, structural, and annual maintenance components. In general the greatest cost of the recommended plan is associated with the structural components. Although all of the structural components are considered necessary in development of an effective storm water management plan, it is not practical to expect implementation of all of the structural components at once. In order to assist in effective implementation of the plan, the structural plan components have been prioritized in the implementation schedule and are dependent on future approvals and funding. Federal, State, and local regulatory approvals are required on most projects, in general.

The streambank stabilization program is essential to reduce sediment loading directly into the streams due to erosion. This project should be annually funded.

The culvert replacement program is considered an annual maintenance program which should be included in the annual schedules and budgets.

The recommended implementation schedule for the storm water management plan is based on water quality improvement, drainage /flooding improvement, and cost effectiveness. The recommended general implementation schedule is presented in Table 10-1.

Table 10-1: Implementation Schedule

Plan Component	Short Range	Medium Range	Long Range
Water Quality Improvement Plan			
Implement Zoning Plan as shown	T		
Industrial Best Management Practices	T		
Roadway Pavement Sweeping	T		
Ice Management Practices	T		
Catch Basin Cleaning	T		
Landscape Practices	T		
Snow Storage Practices	T		
Erosion Control Ordinance Enforcement	T		
Extractive Land Use Areas	T		
Agricultural Practices	T		
Adopt Shoreland Management Ordinance	T		
Public Education and Information Program	T	T	T
Wet Detention Pond: Upper Kelly Lake		T	
Constructed Prior Converted Wetlands		T	
Streambank Stabilization	T	T	T
Regulatory/Ordinance Program			
Adoption and Compliance with the Storm Water Ordinance	T		
Drainage/Flood Control Plan			
Underwood 1	T		
Underwood 2	T		

Plan Component	Short Range	Medium Range	Long Range
Root 1		T	
Root 2			T
Root 3		T	
Root 4	T		
Deer 1 - Buena Park	T		
Regional Detention		T	T
Culvert Replacement Program (no water quality benefits)			
Replace/repair culverts	T	T	T
Ditch Improvement Program (no water quality benefits)			
Repair ditch segments	T	T	T

Short Range is based on obtaining policy by the city council as soon as possible and including required financial and staff resources in the next city budget.

Medium Range - financial and staff resources should be included in the annual city budget in the next 3 to 5 years.

Long Range - financial and staff resources should be included in the annual city budget in the next 5 to 10 years or at the direction of the elected officials/

10.2 Authorities and Partnerships for Plan Implementation

10.2.1 City of New Berlin

The City of New Berlin is ultimately responsible for the implementation of this storm water management plan within the City. New Berlin has the authority needed to implement plan components as outlined in Section 9. Support from all levels of the City=s administration is necessary for the success of this plan. New Berlin implementation responsibilities include administration of the plan as well as operation and maintenance of the plan components. New Berlin is also responsible for several of the plan components such as pavement sweeping, catch basin cleaning,

adoption of a storm water ordinance and enforcement of the Erosion Control Ordinance.

Currently New Berlin has not been notified by the WDNR to obtain a storm water discharge permit. However, it is likely that the City will be required to obtain a Municipal Storm Water Discharge Permit sometime in the future. Information presented in this storm water management plan will provide information for completion of the application. Implementation of this plan will assist New Berlin in compliance with the conditions of the storm water permit.

10.2.2 Wisconsin Department of Natural Resources

The WDNR has broad authority for water quality control, natural resource protection, and water and wetlands regulation. WDNR's authority includes the establishment of water quality criteria and effluent limits, the administration of the Wisconsin Pollutant Discharge Elimination System (WPDES) permitting program, and the conduct of water quality research studies. Natural resource protection responsibilities include the management of fish, wildlife, and habitat resources. The Department also prepared the Root River, Upper Fox River, and Menomonee River Priority Watershed Projects reports and administers the non-point source priority watershed planning program, which assisted in funding of this study. WDNR can also provide technical assistance on the design and application of best management practices. They also have the authority to authorize regulatory approvals on plan components requiring permits. Responsibilities of the WDNR in implementation of this plan are summarized in Table 10-2.

10.2.3 Developers

Developers are responsible for compliance with the City ordinances as well as planning development in accordance with the urban land development guidelines. Compliance with the ordinance will require use of appropriate erosion control techniques for sites greater than 1 acre and storm water detention to maintain runoff flows at the pre-settlement condition and improve runoff water quality. Responsibilities of developers in implementation of this plan are summarized in Table 10-3.

10.2.4 Wisconsin Department of Transportation

The Wisconsin Department of Transportation (WDOT) is responsible for addressing water quantity and quality issues whenever they maintain or upgrade a roadway within their jurisdiction. By working with New Berlin in this storm water management effort, opportunities have been identified for WDOT and New Berlin to partner in implementation of selected plan elements, including the storm water facilities located at Interstate Highway 43 in Calhoun Creek subwatershed. Open communication of future WDOT projects will facilitate the identification of additional joint projects which will be mutually beneficial. Partnership opportunities for WDOT to assist in implementation of this plan are summarized in Table 10-3.

10.2.5 University of Wisconsin - Extension

The University of Wisconsin - Extension can assist New Berlin in providing information and education programs, and by providing technical advice and guidance on storm water related issues. The Extension also may assist New Berlin facilitate public meetings, and develop newsletters, bulletins, and research information. Responsibilities of the University of Wisconsin Extension in implementation of this Plan are summarized in Table 10-3.

10.2.6 Private Property Owners

Industrial, commercial, and residential landowners are responsible for management activities within their boundaries. Private property owners can assist in implementation of this plan by utilizing best management practices and implementing appropriate components of this plan. Responsibilities of private property owners in implementation of this plan are summarized in Table 10-3.

10.2.7 Waukesha County Technical College

The Waukesha County Technical College (WCTC) should partner with the communities in their storm water management efforts. Opportunities for the WCTC to provide education regarding storm water management programs should be explored.

Table 10-2: Storm Water Management Plan Implementation Responsibilities

Component	City of New Berlin	WDNR	Developers	WDOT	Private Property Owners	Others
Water Quality Improvement Plan						
Implement Zoning Plan	T		[			
Industrial Best Management Practices	[	[				T ₍₁₎
Roadway Pavement Sweeping	T					
Ice Management Practices	T					
Catch Basin Cleaning	T					
Landscape Practices	T		T	[	T	[(2)
Snow Storage Practices	T			[		[(2)
Erosion Control Ordinance Enforcement	T					[(2)
Extractive Land Use Areas					T	
Agricultural Practices		T			T	[(2)(3)
Adopt Shoreland Management Ordinance	T				T	
Public Education and Information Program	T					[(3)(4)
Wet Detention Pond: Upper Kelly Lake	T	[			T	

Component	City of New Berlin	WDNR	Developers	WDOT	Private Property Owners	Others
Constructed wetland	T	[	[	T		
Streambank Stabilization	[	[			[	[(3)
Regulatory/Ordinance Program						
Adoption and Compliance with Storm Water Ordinance	T		T			
Drainage/Flood Control Plan						
Underwood 1	T	[				
Underwood 2a & b	T	[				
Root 1	T					
Root 2	T					
Root 3	T					
Root 4	T					
Deer 1 - Buena Park	T				T	
Minor System Flooding Problem Repairs	T				[	
Culvert Replacement Program (no water quality benefits)						
Replace/repair culverts	T					
Ditch Improvement Program (no water quality benefits)						

Component	City of New Berlin	WDNR	Developers	WDOT	Private Property Owners	Others
Repair ditch segments	T					

T indicates primary responsibility; **[** indicates secondary responsibility.

(1) indicates industrial property operators; (2) UW - Extension; (3) Waukesha County Land Conservation Department

(4) New Berlin School District

10.3 Funding the Recommended Plan

Funding sources for the implementation of the Storm Water Management Plan can come from a combination of sources. Potential funding options may include:

- *Property Taxes -City:* funds are accumulated through property taxes and are used for a variety of services throughout the City and are used to pay debt service on financial instruments, such as bonds to pay for larger structural components. Competition for funding of other municipal services may cause significant variation in the amount of funds available for implementation of the Plan.
- *Cost-Share Grants - WDNR:* available to help offset the local cost of implementing the recommended plan under the Wisconsin Nonpoint Source Priority Watershed Program. Not all components of the storm water management plan are eligible for the grant funds. The state may fund through a direct grant up to 100 percent of the design for water quality elements and up to 70 percent of the installation of urban controls such as wet detention ponds. WDNR typically funds up to 70 percent of the design cost and 50 percent of the construction costs for wet detention ponds. Accelerated street sweeping programs may also be eligible for cost sharing. Grant funds are made available through the bi-annual State of Wisconsin budget process and therefore are impacted by state priorities.
- Under the State Non-point Source Priority Watershed Program, cost-share grants for eligible controls must be entered into and implemented within eight years after formal approval of the Priority Watershed Plan. The Root River Watershed Plan was approved by the Wisconsin Natural Resources Board in 1980. The Menomonee River Priority Watershed Plan was approved by the Wisconsin Natural Resources Board on April 23, 1991. The Upper Fox River Watershed and Muskego - Wind Lakes Watershed Plans approved by WDNR in 1994. Therefore, to qualify for cost sharing, eligible practices must be implemented by 2002 within the Upper Fox watershed and the Muskego - Wind Lakes watershed.
- *Sales Tax - Special Tax District:* development of a local sales tax, if authorized by the voting public. The revenue generated is used for improvements within the taxed district. The revenue generated can be used for capital improvements and/or operation and maintenance.
- *Bonds:* general obligation, revenue, or special assessment bonds are normally used by municipalities to fund large capital improvement programs. Repayment of the bond is typically through the general municipality fund. Bonds allow large-scale capital improvement programs to be initiated when the facilities are needed rather than delaying the program until funding is available. These funds cannot be used for operations and maintenance costs.
- *Storm Water Utility:* accumulated by a user charge system. The utility charge system is based on the premise that property owners are responsible for their storm

water runoff. Fees are assessed to property owners based on the estimated amount of storm water discharged from the facility.

- *Pay-As-You Go Sinking Fund*: adjunct to the revenue bond financing. The fund accumulates revenues until sufficient funding is available for a selected project. The project funds are then removed from the fund and the fund restarts accumulation for the next selected project. This method is generally associated with capital improvements where it is not advantageous to incur long-term debt.
- *Fees/Licenses/Permits*: generally the revenue generated is used to cover the costs of permit review or inspections required. These funds are used for administrative and staff cost.
- *Penalties/Fines*: limited funds. The best use of the funding generated by penalties and fees may be utilization in correction of the violation.

Sources of funding considered feasible for the implementation of this plan are summarized in Table 10-3.

Table 10-3: Funding Options for Implementation of the Storm Water Management Plan

Funding Option	Administration of Plan	Design of Components	Construction of Components	Operation & Maintenance
Property Tax - City Funds	T	T	T	T
Cost-Share Grants - WDNR		T	T	
Sales Tax - Special Tax District		T	T	T
Bonds	T	T	T	
Storm water Utility	T	T	T	T
Pay-as-you-go Sinking Fund		T	T	
Fees/ Licenses/Permits	T			
Penalties/Fines	T			

Only three of the funding methods have the ability to fund implementation of all components of the recommended plan; property tax, sales tax, and storm water utility. Numerous combinations of funding sources can be used to fund plan

implementation. However, successful plan implementation requires an equitable, long term funding method.

10.4 Plan Re-Evaluation and Updating

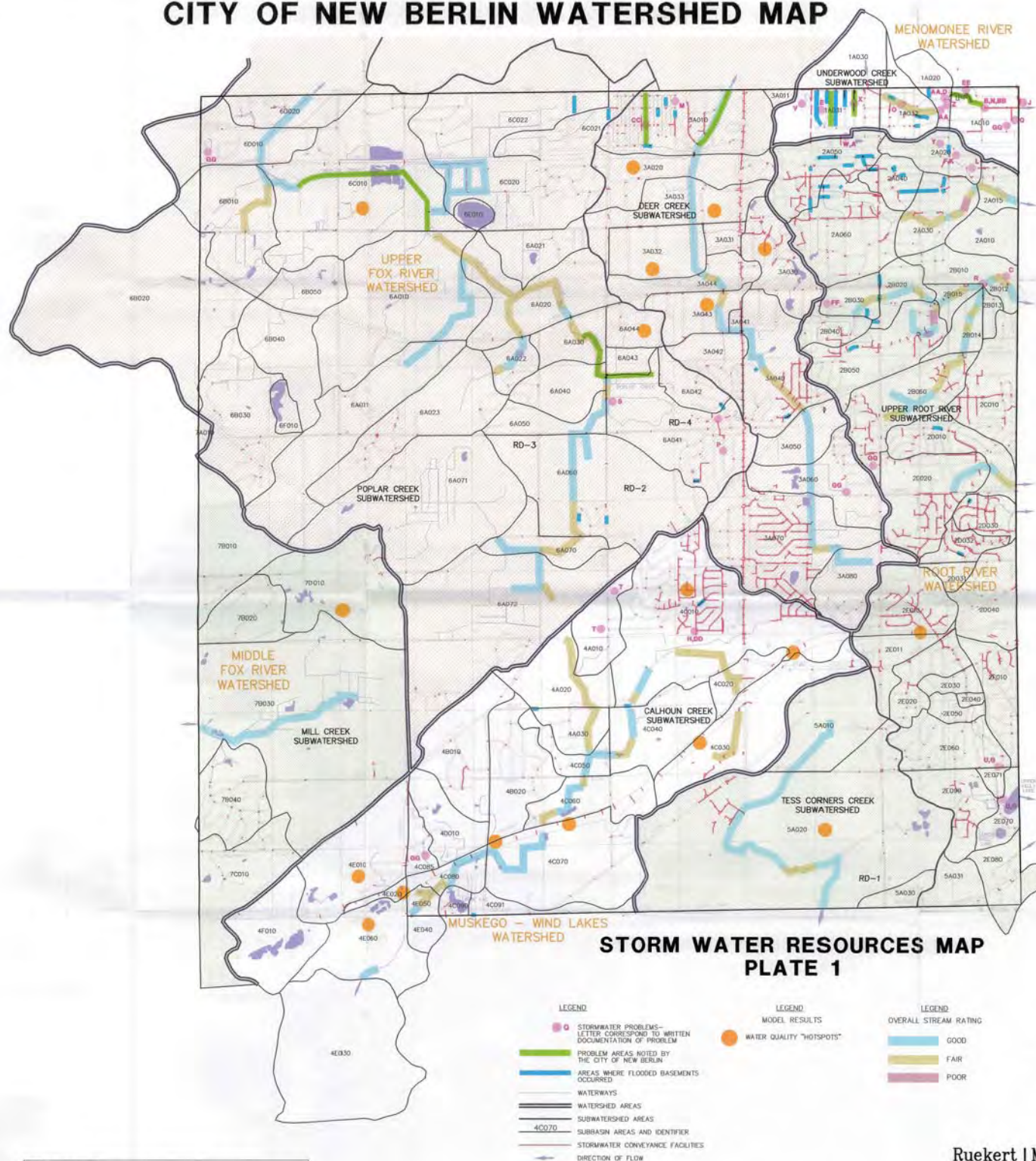
The storm water management plan should be periodically re-evaluated based on changes within the watersheds or within the New Berlin . Plan components should be revised as necessary to reflect development or redevelopment changes and storm water management requirements.

Appendix A

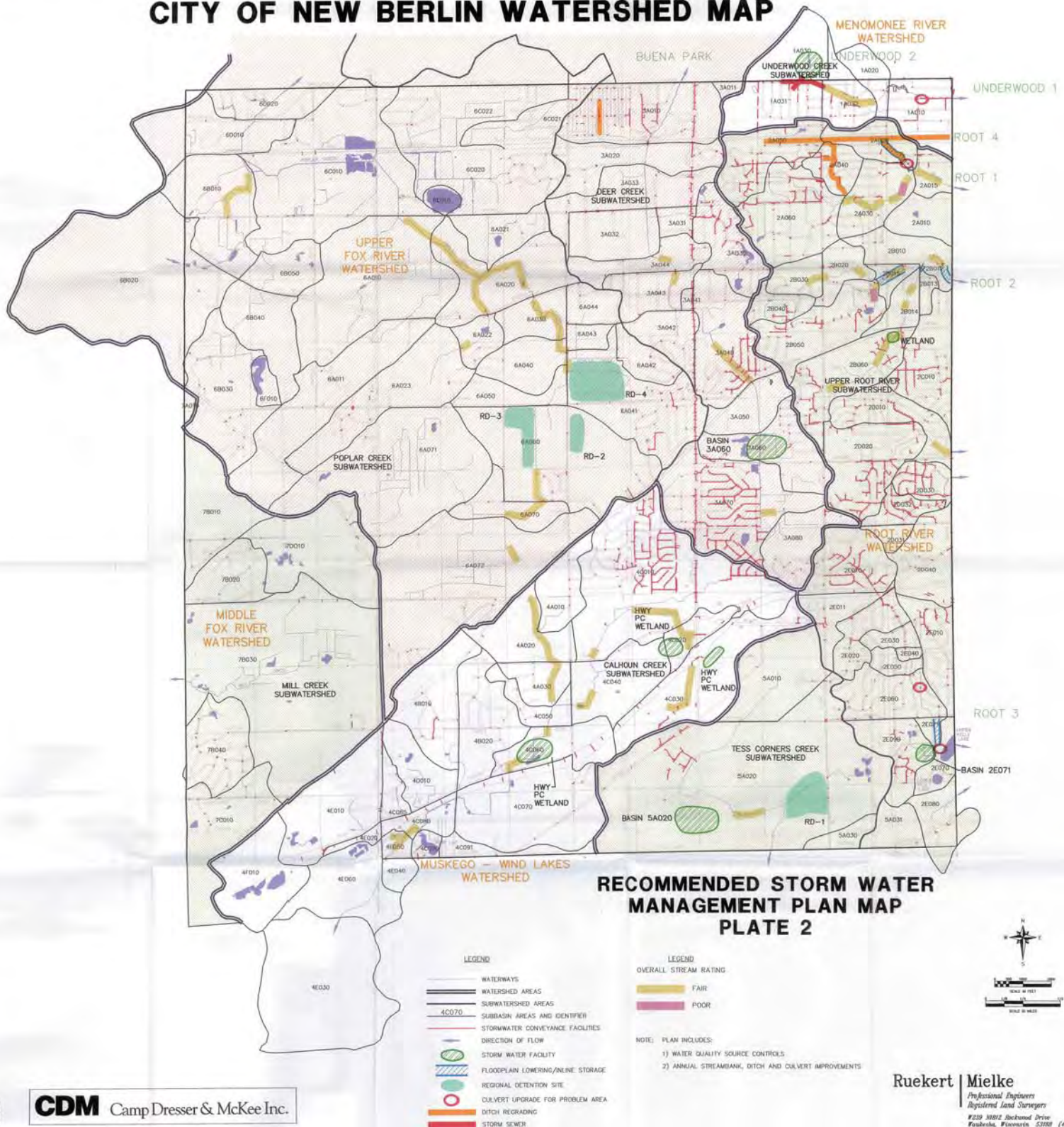
Plate 1 - Storm Water Resources Map

Plate 2 - Recommended Plan Map

CITY OF NEW BERLIN WATERSHED MAP



CITY OF NEW BERLIN WATERSHED MAP



APPENDIX B

Streambank Inventory

City of New Berlin
Stormwater Management Master Plan
Stream Reaches Rated 'Good'

Map Designation Number	Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating
1	TCC-A Designation	0.3	Tributary to Tess Corners Creek from College Ave. north 0.3 mile	Good
2	CC-B Designation	0.2	Tributary to Calhoun Creek from Beloit Rd. south 0.2 mile	Good
3&4	URR-E and URR-B Designation	0.3	Tributary to Root River from 0.2 mile west of intersection of Dakota St. and 133rd St. east to 132nd St.	Good
5	URR-F Designation	0.2	Tributary to Root River from 124th St. northeast to Cleveland Rd.	Good
6	URR-D Designation	0.1	Tributary to Root River from point west of Montana Ave. northeast to 128th St.	Good
7	Poplar Creek Designation	0.2	From Cleveland Ave. 0.2 mile southwest	Good
8	URR-A Designation	0.2	From 124th Street 0.2 mile west	Good
9	UF-E Designation	0.7	Tributary of Poplar Creek from point northwest of Cari-Adam Dr. northeast to junction with Poplar Creek (not including length of dry channel)	Good
10	URR-B Designation	0.1	Tributary to Root River from beginning east 0.1 mile to point extending northwest of Tammy Ln.	Good
11	Mill Creek Designation	1.2	From City Limits east 1.2 mile to point extending north of Hickory Trails	Good
12	CC-C Designation	0.2	Tributary to Calhoun Creek east of Summit Ln. between Dale Dr. and Hilltop Dr.	Good
13	CC-C Designation	0.2	Tributary to Calhoun Creek from Bener Rd. north to junction with CC-A and CC-C	Good
14	URR-D Designation	0.1	Tributary to Root River from point 0.2 mile north of National Ave. north 0.1 mile to point between National Ave. and Cleveland Ave.	Good
15	URR-C Designation	0.4	Tributary to Root River from Sunny Slope Rd. northeast to pond southeast of Fountain Ct.	Good
16	Poplar Creek Designation	0.9	From Calhoun Rd. southwest 0.9 mile to point extending north of Elm Dr.	Good
17	URR-A Designation	0.1	Tributary to Root River from New Berlin Hills Golf Course property line east 0.1 mile	Good
18	URR-A Designation	0.1	Tributary to Root River from point 0.4 mile east of New Berlin Hills Golf Course property line east 0.1 mile	Good
16	CC-H Designation	0.7	Tributary to Calhoun Creek from Tans Rd. north 0.7 mile	Good
17	UF-J Designation	0.1	Tributary to Poplar Creek from UF-L west .01 mile	Good
18	CC-B Designation	0.2	Tributary to Calhoun Creek from Calhoun Rd. west to junction with tributary CC-A and CC-C	Good
19	URR-F Designation	0.1	Tributary to Root River from Cleveland Ave. northeast 0.1 mile to beginning of concrete lining	Good
20	Poplar Creek Designation	0.3	From junction with tributary UF-L west to Observatory Rd.	Good
21	TCC-A Designation	0.8	Tributary to Tess Corners Creek from Grange Rd. 0.8 mile south	Good
22	UF-F Designation	0.4	Tributary to Poplar Creek from New Berlin West High School north to Cleveland Ave.	Good
23	URR-G Designation	0.4	Tributary to Root River from Pohl Rd. northeast 0.4 mile to point extending east of Heather Creek Ct.	Good
24	UF-G Designation	0.6	Tributary to Poplar Creek from junction with Poplar Creek southeast under Calhoun Rd. and east into Malone Park	Good
25	URR-E Designation	0.1	Tributary to Root River from midway point between 130th St. and 131st St. east to point extending northwest of junction between 128th St. and Montana Ave.	Good
26	URR-D Designation	0.2	Tributary to Root River from opening east to point between Sally Dr. and Highpointe Dr.	Good
27	DC-C Designation	0.3	Tributary to Deer Creek from beginning of Deer Creek east to New Berlin High School and Middle School	Good
28	Poplar Creek Designation	1.9	From city limits south to junction with tributary UF-E	Good

Map Designation Number	Stream Reach Designation	Reach Length (miles)	Location	Overall Stream Rating
29	Deer Creek Designation	1.2	From National Ave. south 1.2 miles to point extending south of Hargrove Dr.	Good
30	Deer Creek Designation	0.9	From point 0.1 mile south of Cleveland Ave. southeast to point extending east of Pinewood Creek Ct.	Good
31	CC-E Designation	0.8	Tributary to Calhoun Creek from I-43 east to Linnie Lac	Good
32	URR-D Designation	0.2	Tributary to Root River from Highpointe Dr. north 0.2 mile to point extending southwest of Manitoba Ave.	Good
33	URR-B Designation	0.3	Tributary to Root River north of Montana Ave. from point 0.1 mile east of Sunny Slope Rd. east 0.3 mile	Good
34	UF-L Designation	0.3	Tributary to Poplar Creek from Poplar Creek south 0.3 mile	Good
35	Poplar Creek Designation	0.1	From corner of Victor Rd. and Calhoun Rd. south 0.1 mile along Calhoun Rd.	Good
36	Deer Creek Designation	1.6	From Greenfield Ave. south 1.6 miles	Good
37	CC-B Designation	0.2	Tributary to Calhoun Creek from point 0.1 mile north of Beloit Rd. east 0.2 mile	Good
38	Deer Creek Designation	0.2	From point 0.1 mile northeast of Glendale Dr. southeast 0.2 mile	Good
39	Deer Creek Designation	0.2	From Cleveland Ave. north 0.2 mile	Good
40	UF-H Designation	0.4	Tributary to Poplar Creek from Calhoun Rd. west 0.4 mile	Good
41	UF-M Designation	0.7	Tributary to Poplar Creek from junction with tributary UF-N northeast 0.7 mile	Good
42	UF-N Designation	0.6	Tributary to Poplar Creek from junction with Poplar Creek northeast 0.6 mile	Good

19.3

NEW BERLIN
STREAM EVALUATION SUMMARY

Pfrankuch Method															
REACH				Pfrankuch Method											
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	UPPER BANK				LOWER BANK					TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
				LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION			
6	URR - A	From northerly bend N to area of overhanging trees	0.1	P	F	F	F	G	P	G	P	G	70	Poor	Wooded area/ravine; some larger boulders present within streambed; heavy erosion/cutting found along E bank
4	URR - C	From lake N to point S of Dakota St.	0.1	P	F	F	P	G	E	F	F	F	69	Poor	
3	URR - A	From point just W of property line to New Berlin Hills Golf Course	0.1	F	G	F	F	G	F	F	F	F	65	Fair	Wooded area; bankrock found in spots; deposition and cutting found intermittently but are moderately severe in nature
1	UC - A	From Corner of Meadow Ln. and Sunny Slope Rd. E to end of private property just W of Arcadian Dr.	0.5	F	E	F	F	G	P	G	F/P	F	64	Fair	Wooded ravine; tons of bottom rock; some obstructions near Sunny Slope Rd. but die out as you move E
5	TCC - A	From reach TCC - A (4) to TCC - A (5)	0.1	G	E	P	P	G	F	P	F	G	63	Fair	Pipe at reach TCC - A (5) diverts flow from channel
6	URR - C	From junction of 131st. St. and Dakota St. NE to 133rd St.	0.1	P	F	G	P	G	G	G	P	E	63	Fair	
16	Poplar Creek	From Cleveland Ave. S. past major blockages to dirt road culvert	0.6	E	E	P	F	G	P	P	G/F	F	62	Fair	Wooded area with grass lining bank in spots; some bottom rock; flooding evident due to knocked down grass and extensive bank debris
7	URR - A	From overhanging trees NE to grassy area	0.1	P	F	F	F	G	P	G	G	G	62	Fair	Wooded area; cutting is less significant
7	URR - B	From driveway culvert E to end of ravine	0.1	P	G	G	G	G	P	G	F	F	62	Fair	Wooded ravine with steep slopes; major areas of erosion seen; deposition also evident due to low flow
17	Poplar Creek	From dirt road culvert S to corner of Calhoun Rd. and Victor Rd.	0.2	E	E	F	P	F	P	G	G/F	F	60	Fair	Wooded area; flooding evident; grass lined in parts but is mostly bare earth
5	URR - A	From wooded area E to northerly bend in river	0.1	F	P	F	G	G	P	G	G	G	60	Fair	Wooded area; deposits seen in spots; channel begins to enter ravine type segment
1	CC - B	From I-43 N to culverts under Beloit Rd.	0.2	G	E	F	F	G	P	G/F	G	G	58	Fair	Wooded area; obstructions increase as you move N; bare slopes evident(exposed tree roots)
1	TCC - A	From College Ave. N to reach TCC - A (1)	0.1	G	E	G	F	G	P	G	F	F	58	Fair	
2	URR - A	From end of private property E to point just W of New Berlin Hills Golf Course	0.1	E	E	F	F	G	P	G	F	F	58	Fair	Wooded area; flooding evident due to presence of alternate channels
8	CC - B	From wooded area SW to pond in Calhoun Park	0.2	E	E	F	G	G	P	F	F	F	57	Fair	Wooded area; moderate meandering; flooding evident; pond limits flow somewhat since water still resides in creek bed up to Calhoun Rd.
23	Deer Creek	From point past obstructions SE to 1st major block	0.1	E	E	F/P	G	G	P	P	G	F	56	Fair	Overflow due to block present with shoreline debris; very constricted; lots of bottom rock; grassy/weeded patch surrounded by wooded area
12	Poplar Creek	From grassy area SE to junction with UF - F	0.1	E	E	G	F	G	P	G	F	F	56	Fair	Partially wooded area
5	UF - F	From wetland/pond N to area of deposition and cutting	0.2	G	E	P	F	G	P	F	G	G	56	Fair	Heavy wooded area/shrubs; some rapids found; flow is now evident; heavy bottom rock; very dense
6	UF - F	From area of cutting and deposition NW beyond small wetland to junction with Poplar Creek	0.3	E	E	F	F	G	P	F	F	G	56	Fair	Area is still wooded but not as dense
11	URR - A	From wooded area E to grassy area (mowed)	0.1	F	G	F	F	G	P	F	F	F	56	Fair	Wooded area; grass lines banks in spots; major deposition found in center portion of reach
5	URR - D	From point SW of Manitoba Ave. N to point near house 2976 and asphalt bridge	0.1	F	F	G	F	G	G	E	F	G	56	Fair	
3	URR - G	From point of heavy erosion and deposition SE to corner of Howard Ave. and 124th St.	0.1	G	E	F	F	G	P	G	F	G	56	Fair	Wooded ravine; houses on N side; church on S side; bottom rock found
15	Deer Creek	From 1st industrial building SE to point due E of industrial building on E side	0.1	F	F	E	G	G	G	E	F	F	55	Fair	
24	Deer Creek	From first major block E to second major block	0.1	F	E	E	G	G	P	G	F	F	55	Fair	Grasses and shrubs die out and are replaced with solely trees; bottom rock is clearly evident; lots of debris from flooding evident on banks
9	Poplar Creek	From junction with UF - E SE to wooded area	0.2	E	E	F	G	G	P	G	F	F	55	Fair	Wooded area with some grass along NE side
9	URR - A	From wooded area E to grassy/reeded area	0.1	G	F	F	G	F	P	F	G	F	55	Fair	Wooded area; tall grass lines banks; some small bank rock found in parts
5	URR - C	From Point S of Dakota St. N to point E of junction of Dakota St. and 131st St.	0.1	F	E	G	P	E	P	E	F	E	55	Fair	
14	Deer Creek	From point S of 162nd St. E to point S of 1st industrial building to N	0.1	F	F	E	G	E	G	E	F	F	54	Fair	
18	Deer Creek	From Cleveland Ave. S to point due W of 1st industrial building on W side	0.1	P	G	F	E	E	P	F	G	G	54	Fair	Vegetation was found obstructing channel
14	Poplar Creek	From beginning of nature preserve S to grassy area	0.4	E	E	F	F	G	P	G	G	F	54	Fair	Wooded area; bottom rock observed; some grass found along banks
3	UC - A	From Elm Grove Rd. E to culvert under Meadow Ln.	0.3	E	E	F	F	G	P	G	F	G	54	Fair	Wooded area; meandering common; flooding evident due to bank debris and knocked over plants
3	UF - A	From gravel road culvert N to impassable area S of R tracks	1.0	F	E	F	F	G	P	F	F	F	54	Fair	Moderate flow; wooded ravine; some bottom rock
10	Poplar Creek	From wooded area SE to blockage	0.2	E	G	G	E	G	P	G	F	F	53	Fair	Tall grassy area
3	URR - D	From woods east under Foxwood Dr. culvert to Highpointe Dr.	0.5	E	E	G	G	G	P	F	F	G/F	53	Fair	Flow only would occur under high water; massive deposition NE of Foxpoint Dr. culvert; wooded area with HEAVY brush and shrubs; obstructions found but do not seem to alter flow since high water will flood entire area

NEW BERLIN
STREAM EVALUATION SUMMARY

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
4	CC - B	From culvert W to grassy/wetland area	0.2	E	E	F	F	G	P	F	G	G	52	Fair	Wooded area; flooding evident due to bank debris
10	CC - B	From I-43 S to Westridge Dr.	0.5	G	E	F	F	G	P	G	G	G	52	Fair	Heavy brush and trees with some grass along E side
32	Deer Creek	From obstruction S to point W of New Berlin Eisenhower HS/MS and end of Deer Creek	0.2	F	G	G	G	G	G	P	F	E	52	Fair	
2	UC - A	From end of private property E past Arcadian Dr. to Elm Grove Rd.	0.2	G	E	F	F	G	P	G	G	G	52	Fair	Wooded area inbetween private property; grass lines banks occasionally; bottom rock found
4	UF - F	From Cleveland Ave. N to end of wooded area and wetland/mucky pond	0.1	F	E	F	F	G	F	G	G	G	52	Fair	Wooded area; some bottom rock; not much flow from Cleveland Ave. to pond
10	URR - A	From grassy/reeded area E to wooded area	0.1	F	G	G	G	G	P	G	G	F	52	Fair	Tall grassy area with trees interspersed; cutting found in parts
3	URR - B	From Sunny Slope Rd. E past major deposition to blockage	0.1	E	E	G	F	G	P	G	G	F	52	Fair	Wooded area; more deposition observed
1	CC - C	From I-43 N to grassy area	0.3	F	E	F	G	G	P	G	G	G	51	Fair	Wooded area; trees overhang and cover channel; shrubs are predominant
19	Poplar Creek	From beginning of wooded area on E side S along Calhoun Rd. to culvert under Calhoun Rd.	0.1	F	E	G	G	G	P	E	F	G	51	Fair	Wooded on E side; Grassy on N side; flow is evident; moderate deposition near culvert
1	UF - A	From wetland N of Cleveland Ave. N to Lincoln Ave.	0.2	E	E	G	P	G	P	G	E	F	51	Fair	Heavy brush and grass
2	CC - B	From Beloit Rd. N to end of wooded area	0.2	E	E	F	F	G	P	G	G	G	50	Fair	Wooded area; bottom rock; flooding evident
6	CC - B	From wooded area W and S to Beloit Rd.	0.1	E	E	F	F	G	P	G	G	G	50	Fair	Wooded area; flooding evident
1	CC - H	From Lake SW to point N of College Ave. culvert and end of wooded area	0.4	E	E	G	F	G	P	F	G	G	50	Fair	Wooded area; bottom rock found; flooding evident; fast current
25	Deer Creek	From second major block SE to point W of end of Acresdale Rd.	0.1	G	E	F	E	G	P	G	F	G	50	Fair	Heavily wooded ravine; lots of carried debris cutting very significant in parts
13	Poplar Creek	From junction with UF - F SE to nature preserve	0.3	E	E	F	F	G	P	G	G	G	50	Fair	Wooded area; well defined channel; some bottom rock
24	Poplar Creek	From corner of Johns Dr. and Observation Dr. SW to junction with UF - L	0.4	E	E	P	E	G	P	F	G/F	G	50	Fair	Heavy wooded area; bank debris everywhere
2	CC - A	From second dirt road culvert N to Beloit Rd.	0.1	G	E	F	G	G	P	G	G	G	49	Fair	Heavy shrubs; some trees and grass
23	Poplar Creek	From tall grassy area S to corner of Elm Dr. and Observation Dr.	0.3	G	E	G	G	G	P	E	F	G	49	Fair	Grass lined with trees interspersed; good flow
1	URR - A	From Meadowlark Dr. E to end of private property	0.1	E	E	G	G	G	P	G	F	G	49	Fair	Wooded area; homeowner uses RR ties to help stop erosion in his property
1	URR - D	From beginning near Long Acre Dr. E to opening on N side	0.1	E	E	G	G	G	P	G	G	F	49	Fair	Wooded area; flooding evident due to bank debris and overturned grass
2	URR - E	From 132nd St. E past 130th St. to point midway between 130th and 128th St.	0.2	F	G	G	F	G	G	E	F	E	49	Fair	
3	CC - A	From Beloit Rd. N to end	0.6	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; crops border N and W side
3	CC - C	From end of grassy area E and N to Benier Rd. culvert	0.2	G/F	E	G	G	G	P	G	G	G	48	Fair	Trees line S side; grass on N side; well defined channel
1	CC - G	From junction with CC - H NW to I-43	0.1	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; some bottom rock; flooding evident; smaller flow than seen in CC-H (reach 1)
11	Deer Creek	From 6th industrial building S to 7th industrial building to E side	0.1	F	E	E	E	G	G	G	F	F	48	Fair	Very little flow observed
11	Poplar Creek	From blockage SE to grassy area	0.1	E	E	G	E	G	P	E	F	F	48	Fair	Grassy area with some trees interspersed
2	UF - A	From Lincoln Ave. N to gravel road culvert	0.2	E	E	F	E	G	P	F	G	G	48	Fair	Heavy woods/brush; some grassy parts; small twigs found throughout which blocked creek; not significant flow
1	UF - F	From Willow Rd. NW to New Berlin West HS fence	0.2	E	E	F	F	G	P	G	E	G	48	Fair	Dry channel from beginning to Willow Rd.; no water found in channel; area is mixture of grass and shrubs
4	UF - H	From wooded area W to junction with UF - L	0.2	E	E	G	F	G	P	G	G	G	48	Fair	Wooded area; not too much undergrowth; no flow/water; flooding evident everywhere; whole area is under water during significant rains
2	URR - B	From blockage E to Sunny Slope Rd.	0.2	E	E	G	F	G	P	G	G	G	48	Fair	Bottom rock observed; wooded area; weak vegetative cover observed
2	URR - F	From Cleveland Rd. N to beginning of concrete lining on outside wall of creek	0.2	G	E	G	F	G	P	G	G	G	48	Fair	Wooded area; private property lines outside edge of creek
4	URR - F	From Cleveland Rd. SW to 128th St.	0.1	G	E	G	F	G	P	E	G	G	48	Fair	Wooded area; bottom rock found
1	CC - A	From junction with CC - B and CC - C N under dirt road culvert to second dirt road culvert	0.3	F	E	E	G	G	P	E	G/F	G	47	Fair	Grassy area; some trees interspersed; cutting occurring during high flow
3	CC - B	From end of wooded area W to culvert under grassy area	0.1	G	E	G	G	G	P	E	G	G/F	47	Fair	Tall grassy area; with trees and reeds interspersed; intermittent deposition; well defined channel
26	Deer Creek	From Acresdale Rd. S to culverts under National Ave.	0.3	F	E	G	G	G	P	E	G	G	47	Fair	Grassy area with trees lining upper parts; deeper ravine/ditch; passes under National Ave. and San Mateo Dr.; steep slopes but has room to contain flooding
7	URR - D	From midway point N to point nearly due W of Montana Ave.	0.1	F	E	G	F	E	G	F	F	E	47	Fair	Twigs and branches were found under man-made bridge
3	TCC - A	From reach TCC - A (2) to TCC - A (3)	0.2	F	E	G	E	G	F	E	E	P	46	Good	
2	URR - C	From Sandra Ln. NE to point adjacent to Fieldpointe Dr.	0.2	F	F	G	G	E	G	G	G	E	46	Good	
7	CC - B	From Beloit Rd. S to turn into wooded area	0.2	E	E	G	G	G	P	G	G	G	45	Good	Corn fields on W side; trees and shrubs on E side

NEW BERLIN
STREAM EVALUATION SUMMARY

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
22	Deer Creek	From grassy area with some trees interspersed SE to end of obstructions	0.1	E	E	G	G	G	P	G	G	G	45	Good	Still wooded; grass begins to be seen lining banks again
2	Mill Creek	From beginning of wooded area to point N of Hickory trails	0.5	E	E	G	G	G	P	G	G	G	45	Good	Wooded area between farm fields
2	TCC - A	From reach TCC - A (1) to TCC - A (2)	0.1	G	E	G	G	G	G	E	F	G	45	Good	
6	TCC - A	From reach TCC - A (5) to TCC - A (6)	0.3	E	E	E	G	G	P	E	E	P	45	Good	
1	UF - E	From point near Carl-Adam Dr. NE to tall grassy area	0.3	E	E	G	G	G	P	G	G	G	45	Good	Wooded area; little flow
8	URR - B	From ravine E to corner of Dakota St. and 132nd St.	0.2	E	E	G	G	G	P	G	G	G	45	Good	Wooded area
8	URR - D	From point W of Montana Ave. NE to 128th St.	0.1	F	G	G	F	G	G	E	G	E	45	Good	
1	URR - E	From Dakota St. E to 132nd St.	0.1	G	E	G	G	G	P	G	G	G	45	Good	Wooded area lining Dakota St.
1	URR - F	From culvert under 124th St. NE to culvert under Cleveland Rd.	0.2	E	E	G	G	G	P	G	G	G	45	Good	Wooded area; good bottom rock; pool of water found in front of culvert under 124th St.
2	URR - G	From end of Heather Creek Ct. E to heavy erosion and deposition	0.2	E	E	G	G	G	P	G	G	G	45	Good	Wooded area with grass along banks occasionally; standing water/no flow; some bottom rock found
15	Poplar Creek	From grassy area SE to Cleveland Ave.	0.2	E	E	G	E	G	P	G	G	G	44	Good	Tall grassy area with trees and shrubs interspersed; pond found near culvert
21	Poplar Creek	From culvert under Coffee Rd. S to steep slope	0.2	F	E	G	E	G	P	E	G	G	44	Good	Grass lined on both sides with some trees along E side
2	UF - E	From grassy area NE to Cleveland Ave.	0.1	E	E	F	E	G	P	G	G	G	44	Good	Tall grassy area with some trees
12	URR - A	From grassy area E to 124th Street	0.2	F	F	E	E	G	P	E	G	E	44	Good	Grassy area; mowed/cut; small channel meanders within larger "high flow" channel; some ponding is evident; mass wasting found along upper bank; moderate cutting found in spots (>12" but on whole cutting is good)
3	CC - H	From Tans Rd. N to private property and barbed wire fence	0.6	E	E	E	G	G	P	G	G	G	43	Good	Creek runs into quarry property; wooded area; assume reach is similar to this point but not totally certain
4	Deer Creek	From Rogers Dr. S to 4th industrial building on E side	0.2	G	G	E	G	E	P	G	G	E	43	Good	Moss observed
1	URR - B	From beginning of creek E to first blockage	0.1	E	E	G	G	G	P	E	G	G	43	Good	Areas of rock fill found; wooded area; some bottom rock observed; well defined channel
4	URR - B	From blockage E to opening	0.1	G	E	G	G	G	P	G	G	E	43	Good	Wooded area between private property
2	CC - C	From end of wooded area N just past E bend	0.2	G	E	G	E	G	P	E	G	G	42	Good	Grassy area with trees set back from channel
4	CC - C	From Bener Rd. N to junction with CC - A and CC - B	0.2	G	E	G	E	G	P	E	G	G	42	Good	Wooded on W side; grassy on E side; creek lines W edge of tree farm; CC - B appears to contribute majority of flow
3	Poplar Creek	From junction with UF - A SE to power company and blockage	0.2	G	E	F	E	G	P	G	E	G	42	Good	Wooded area with grass lined banks; border S end of power company; wetlands appear to be seen to S; well defined channel
26	Poplar Creek	From area E of big red barn NW to Observatory Dr.	0.2	E	E	G	E	G	P	G	G	G	42	Good	Wooded area inbetween crops most of the time; some grass close to culvert
6	URR - D	From asphalt bridge and house N to point midway between National Ave. and Cleveland Ave.	0.1	G	G	G	F	F	G	G	E	E	42	Good	
29	Deer Creek	From area of deposition S to blockage	0.2	E	E	G	G	G	P	E	E	G/F	41	Good	Blockage due to fallen tree and collected debris found; area lines farmers fields to E; creek contained within ravine/ditch
2	UF - F	From HS fence E and N to culvert under newly constructed road and original channel	0.3	G	E	E	P	G	P	E	E	E	41	Good	Standing water/no flow; reeded area just N of fence then becomes dirt lined channel; school re-routed channel
4	URR - A	From property line E past second foot bridge to wooded area	0.1	F/P	F	E	E	G	P	E	E	E	41	Good	Grassy area; mowed/cut; small channel meanders within larger "high flow" channel; some spots have nearly 90 degree bank slopes; mass wasting found along upper bank
8	URR - A	From grassy area E to wooded area past series of foot bridges to wooded area	0.2	F	G	E	E	G	P	E	G	E	41	Good	Grassy area; mowed/cut; small channel meanders within larger "high flow" channel; some ponding is evident; mass wasting found along upper bank; near wooded area channel shows severe undercutting even during low flow
1	Deer Creek	From Greenfield Rd. S to end of woods and beginning of reeds	0.3	E	E	E	E	G	F	E	G	F	40	Good	Bottom rock observed; wooded on E side; private property on W side; some rapids encountered
21	Deer Creek	From culverts under Moorland Rd. and Ryerson Rd. S and E to beginning of grassy area	0.3	E	E	G	E	G	P	G	G	G	40	Good	Meandering channel; tall grassy stretch; apartments found to W; wooded area found to E
30	Deer Creek	From blockage S to Harcove Dr.	0.3	E	E	E	G	E	P	E	E	F	40	Good	
1	Mill Creek	From City limits E to woded area	0.7	E	E	G	E	G	P	E	G	G	40	Good	Grassy with trees interspersed; wetland; multiple channels
5	Poplar Creek	From wetland E to pond/wetland on S end of RR tracks	0.3	G	E	G	E	G	P	G	E	G	40	Good	Channel is wide and well defined; grass lines S side; trees and shrubs line N side; N side has steeper slope; floating moss seen; water still appears to be stagnant
7	Poplar Creek	From beginning of wooded area S to Lincoln Ave.	0.2	E	E	G	E	G	P	E	G	G	40	Good	Wooded on W side; Grassy on E side; well defined channel

NEW BERLIN
STREAM EVALUATION SUMMARY

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
8	Poplar Creek	From Lincoln Ave. S to junction with UF - E	0.1	E	E	G	E	G	P	E	G	G	40	Good	Tall grassy area, well defined channel; cutting and deposition found along meanders; intermittent grass and trees
20	Poplar Creek	From Calhoun Rd. culvert SW to Coffee Rd.	0.3	F	E	G	E	G	P	E	E	G	40	Good	Grassy area with trees and shrubs interspersed; corn fields found along sides; significant cutting is evident near Coffee Rd. culvert
22	Poplar Creek	From steep slope S to reeded area	0.4	E	E	G	E	G	P	E	G	G	40	Good	Tall, thick grassy areas with occasional patches of woods; some flooding evident
8	TCC - A	From reach TCC - A (7) to TCC - A (8)	0.2	G	E	E	E	G	P	E	E	F	40	Good	The amount of deposition is increasing as construction becomes closer
3	UF - E	From Cleveland Ave. NE along golf course to point somewhere S of junction with Poplar Creek	0.3	E	E	G	E	G	P	E	G	G	40	Good	Grassy area with intermittent patches of tree and shrubs
1	UF - J	From junction with UF - L W	0.1	E	E	G	E	G	P	E	G	G	40	Good	Wooded area with grassy banks; floating moss; stagnant water/no flow visible
9	CC - B	From Calhoun Rd. culverts W to junction with CC - A and CC - C	0.2	F	E	G	G	G	P	E	E	E	39	Good	Grass lined area in tree farm
27	Deer Creek	From National Ave. culvert and near Culver's Restaurant S to point W of the far W apartment building	0.1	F	G	E	G	E	G	E	G	E	39	Good	
6	Poplar Creek	From pond/wetland SE to wooded area	0.3	G	E	E	E	E	P	E	G	G	39	Good	Channel borders area of construction (compost/sod industry) on NE side; grass lined with some trees set back from channel
3	URR - F	From concrete lining SW to Cleveland Rd.	0.1	E	E	G	G	G	P	E	E	G	39	Good	Wooded on S side; concrete wall on N side; little flow; grass along bottom before reaching culvert under Cleveland Rd.
2	CC - H	From end of woods S to College Ave.	0.1	G	E	G	E	G	P	E	G	E	38	Good	Tall grassy area; trees set back from banks
1	DC - C	From end of Deer Creek E to New Berlin Eisenhower HS/MS	0.3	E	E	G	E	G	P	G	E	G	38	Good	Reeded area with some high grass; little flow observed
2	Deer Creek	From beginning of reeded area S to two steel 5' diameter culverts under railroad	0.3	E	E	E	E	G	P	E	G	G	38	Good	Evidence of flooding seen; well defined channel; rapids observed; reeded area with tall grass
4	Poplar Creek	From beginning of power company E to access road and bridge	0.1	G	E	G	E	G	P	E	E	G	38	Good	Well defined channel; water up to vegetative bank; wetland found on E side of bridge; Tall grass on S side; power company and some trees on N side; water appears to be stagnant
1	UF - G	From junction with Poplar Creek SE under Calhoun Rd. and E into wetland	0.6	E	E	G	E	G	P	G	E	G	38	Good	Channel meanders through wetland; not well defined; some problems following it; no noticeable flow; inlet to Poplar Creek barely visible; grass line darea with trees interspersed; channel could not be found beyond wetland
2	UF - L	From area of shrubs N to junction with Poplar Creek	0.2	E	E	G	E	G	P	G	G	E	38	Good	Grass on W side; shrubs/trees on E side
2	URR - D	From opening E to woods	0.2	E	E	E	E	G	P	E	G	G	38	Good	Grassy area; pocket of water found; no flow flooding evident
3	URR - E	From midway point E to point NW of junction of 128th St. and Montana St.	0.1	F	E	G	G	E	G	E	G	E	38	Good	
1	CC - E	From Martin Rd. E to northern bend in creek S of I-43	0.3	E	E	G	G	G	P	G	E	E	37	Good	Moderate flow evident; wide channel with trees set back
17	Deer Creek	From point at center of industrial building S to Cleveland Ave.	0.1	G	G	E	E	G	F	E	E	G	37	Good	Some cutting was observed
1	URR - C	From Sunny Slope Rd. NE to point across the street from Sandra Ln.	0.1	G	G	E	E	G	F	E	G	E	37	Good	
3	URR - C	From point adjacent to Fieldpoint Dr. NE to lake recreational area	0.1	E	E	E	F	F	G	G	E	E	37	Good	
25	Poplar Creek	From junction with UF - L W to wooded area E of big red barn	0.1	E	E	G	E	G	P	E	G	E	36	Good	Tall grassy area with some trees interspersed
3	UF - F	From culvert N to Cleveland Ave.	0.1	E	E	G	E	G	P	E	E	G	36	Good	Original channel; reeded with some shrubs and tall grass
12	Deer Creek	From 7th industrial building S to Glendale Rd.	0.1	G	E	E	E	E	G	E	E	F	35	Good	
4	URR - D	From Highpoints Dr. N under National Ave. to point SW of Manitoba Ave.	0.2	E	E	E	G	G	G	F	E	E	35	Good	A rock dam was observed; area of new trees and grass
2	CC - E	From Martin Rd. W along I-43 to southerly bend and wetland N of former lake	0.5	F	E	E	E	G	P	E	E	E	34	Good	Grassy area; water up to vegetative bank
8	Deer Creek	From Lincoln Ave. S to end of 3rd industrial building from Lincoln Ave.	0.2	E	E	F	E	G	G	F	E	E	34	Good	Deep moss observed
20	Deer Creek	From point across from parking lot S and E up to corner of Ryerson Rd. and Moorland Rd.	0.3	E	E	E	G	E	P	G	E	E	34	Good	Grass lined channel
28	Deer Creek	From W apartment building S past end of apartment complex on E side to first area of deposition	0.4	E	E	G	G	F	G	G	E	E	34	Good	
18	Poplar Creek	From corner of Victor Rd. and calhoun Rd. S to wooded area lining Calhoun Rd.	0.1	F	E	E	E	G	P	E	E	E	34	Good	Grassy area along front of industrial building
5	CC - B	From wetland W to wooded/grassy area	0.2	E	E	E	E	F	P	E	E	E	33	Good	
9	Deer Creek	From 3rd industrial building S to end of 4th industrial building	0.1	E	E	E	G	G	G	F	E	E	33	Good	Floating moss observed
1	UF - H	From Calhoun Rd. W to New Berlin Center School	0.1	E	E	E	G	G	P	E	E	E	33	Good	Grassy area directly inbetween farm crops
3	UF - H	From corn fields W to wooded area	0.2	E	E	E	G	G	P	E	E	E	33	Good	Grass lined; no water present; corn fields line both N and S sides
6	Deer Creek	From 5th industrial building S to 7th industrial building on E side and W of 162nd St. across from parking lot	0.1	E	E	E	G	E	P	E	E	E	32	Good	Flow picks up; less moss observed

NEW BERLIN
STREAM EVALUATION SUMMARY

REACH				UPPER BANK				LOWER BANK							
NO.	DESCRIPTION	LOCATION	LENGTH (miles)	LANDFORM SLOPE	MASS WASTING OR FAILURE	DEBRIS JAM POTENTIAL	VEG. BANK PROTECTION	CHANNEL CAPACITY	BANK ROCK CONTENT	OBSTRUCTIONS	CUTTING	DEPOSITION	TOTAL POINTS FOR REACH	REACH CONDITION RATING	COMMENTS
2	Poplar Creek	From Greenfield Ave. S past blockage to RR tracks and junction with UF - A	0.3	E	E	G	E	G	P	E	E	E	32	Good	Grassy near culvert than wooded with grass lining W bank; some branches submerged
6	URR - B	From wooded area E past small wooded area to grass opening to first driveway culvert	0.1	E	E	E	E	G	P	G	E	E	32	Good	Grassy area; sections seem to be mowed regularly; wooded area to S
1	URR - G	From Pohl Rd. NE to point N of end of Heather Creek Ct.	0.2	G	E	E	E	G	P	E	E	E	32	Good	Grassy area between private homes; some trees set back from creek bed
7	TCC - A	From reach TCC - A (6) to TCC - A (7)	0.3	E	E	E	E	F	P	E	E	E	31	Good	
1	UF - M	From point S of RR tracks to junction with Poplar Creek	0.7	G	E	E	E	E	P	E	E	E	31	Good	Well defined channel along RR tracks; Tall grass lines banks
1	UF - N	From point S of RR tracks to junction with Poplar Creek	0.6	G	E	E	E	E	P	E	E	E	31	Good	Well defined channel along RR tracks; Tall grass lines banks
3	Deer Creek	From culverts under railroad S to Rogers Dr.	0.1	E	E	E	E	G	P	E	E	E	30	Good	All grass (mowed regularly); concrete lined bottom but creek has started to meander over it
5	Deer Creek	From 4th industrial building S to 5th industrial building	0.1	E	E	E	G	E	G	G	E	E	30	Good	Moss observed on both bottom and edge of bank
13	Deer Creek	From Glendale Rd. E to point nearly due S of 162nd St.	0.1	G	G	E	E	E	G	E	E	E	30	Good	
1	Poplar Creek	From City limits S to culvert under Greenfield Ave.	0.4	E	E	E	E	G	P	E	E	E	30	Good	Substantial channel; Tall grass with some trees along W bank; no erosion evident due to water being up to vegetation
2	UF - H	From School SW past wetland to corn fields	0.1	E	E	E	E	G	P	E	E	E	30	Good	Grassy area; flow is not evident beyond small wetland
1	UF - L	From wooded area N through grassy area to area of shrubs	0.1	E	E	E	E	G	P	E	E	E	30	Good	Tall grassy area with trees set back from channel
31	Deer Creek	From Harcove Dr. S past reeded area to obstruction	0.2	E	E	E	E	E	P	E	E	E	29	Good	Grassed area with some reeds interspersed
16	Deer Creek	From point due E of industrial building SE to point E of center of industrial building	0.1	E	E	E	G	E	G	E	E	E	28	Good	
5	URR - B	From opening E to wooded area	0.1	E	E	G	E	G	G	E	E	E	28	Good	Larger rocks are evident along banks and bottom; little erosion and deposition seen; improved by land owners
7	Deer Creek	From 7th building to E S to Lincoln Ave.	0.1	E	E	E	E	E	F	E	E	E	27	Good	
10	Deer Creek	From end of 4th industrial building S to 6th industrial building on E side	0.1	E	E	E	E	F	G	E	E	E	27	Good	
19	Deer Creek	From 1st industrial building on W side S to point between 2nd and third industrial buildings to W and due W of parking lot and lawn	0.2	E	E	E	E	E	F	E	E	E	27	Good	
4	TCC - A	From reach TCC - A (3) to TCC - A (4)	0.1												Dry area; good vegetation; no visible stream channel
			33.7												

APPENDIX C

Storm Water Management System Analysis

- C.1 Rainfall Distribution Input**
- C.2 Hydrologic Input for Various Land Uses**
- C.3 Derivation of Unit Runoff Coefficients**
- C.4 Culvert Capacity Analysis**
 - C.4.1 Approach**
 - C.4.2 Culvert Analysis Database**
- C.5 SWMM Hydrologic and Hydraulic Analysis Results**
- C.6 Summary Report on an Evaluation of the Wetlands of the City of New Berlin, Waukesha County, Wisconsin, for their Potential for Storm Water Detention**

Exhibit C - 1
Median Time Distributions of Heavy Storm Rainfall at a Point
2-year event
City of New Berlin

Time	First quartile	Second quartile	Third quartile	1-hr.		3-hr.		6-hr.		12-hr.		24-hr.	
				1.27		1.73		2.03		2.35		2.7	
0%	0%	0%	0%	0.00		0.00		0.00		0.00		0.00	
5%	16%	3%	3%	0.20	0.20	0.28	0.28	0.32	0.32	0.07	0.07	0.08	0.08
10%	33%	8%	6%	0.42	0.22	0.57	0.29	0.67	0.35	0.19	0.12	0.16	0.08
15%	43%	12%	9%	0.55	0.13	0.74	0.17	0.87	0.20	0.28	0.09	0.24	0.08
20%	52%	16%	12%	0.66	0.11	0.90	0.16	1.06	0.18	0.38	0.09	0.32	0.08
25%	60%	22%	15%	0.76	0.10	1.04	0.14	1.22	0.16	0.52	0.14	0.41	0.08
30%	66%	29%	19%	0.84	0.08	1.14	0.10	1.34	0.12	0.68	0.16	0.51	0.11
35%	71%	39%	23%	0.90	0.06	1.23	0.09	1.44	0.10	0.92	0.24	0.62	0.11
40%	75%	51%	27%	0.95	0.05	1.30	0.07	1.52	0.08	1.20	0.28	0.73	0.11
45%	79%	62%	32%	1.00	0.05	1.37	0.07	1.60	0.08	1.46	0.26	0.86	0.14
50%	82%	70%	38%	1.04	0.04	1.42	0.05	1.66	0.06	1.65	0.19	1.03	0.16
55%	84%	76%	45%	1.07	0.03	1.45	0.03	1.71	0.04	1.79	0.14	1.22	0.19
60%	86%	81%	57%	1.09	0.03	1.49	0.03	1.75	0.04	1.90	0.12	1.54	0.32
65%	88%	85%	70%	1.12	0.03	1.52	0.03	1.79	0.04	2.00	0.09	1.89	0.35
70%	90%	88%	79%	1.14	0.03	1.56	0.03	1.83	0.04	2.07	0.07	2.13	0.24
75%	92%	91%	85%	1.17	0.03	1.59	0.03	1.87	0.04	2.14	0.07	2.30	0.16
80%	94%	93%	89%	1.19	0.03	1.63	0.03	1.91	0.04	2.19	0.05	2.40	0.11
85%	96%	95%	92%	1.22	0.03	1.66	0.03	1.95	0.04	2.23	0.05	2.48	0.08
90%	97%	97%	95%	1.23	0.01	1.68	0.02	1.97	0.02	2.28	0.05	2.57	0.08
95%	98%	98%	97%	1.24	0.01	1.70	0.02	1.99	0.02	2.30	0.02	2.62	0.05
100%	100%	100%	100%	1.27	0.03	1.73	0.03	2.03	0.04	2.35	0.05	2.70	0.08

Exhibit C - 1
Median Time Distributions of Heavy Storm Rainfall at a Point
10-year event
City of New Berlin

Time	First quartile	Second quartile	Third quartile	1-hr.		3-hr.		6-hr.		12-hr.		24-hr.	
				1.81		2.47		2.89		3.36		3.86	
0%	0%	0%	0%	0.00		0.00		0.00		0.00		0.00	
5%	16%	3%	3%	0.29	0.29	0.40	0.40	0.46	0.46	0.10	0.10	0.12	0.12
10%	33%	8%	6%	0.60	0.31	0.82	0.42	0.95	0.49	0.27	0.17	0.23	0.12
15%	43%	12%	9%	0.78	0.18	1.06	0.25	1.24	0.29	0.40	0.13	0.35	0.12
20%	52%	16%	12%	0.94	0.16	1.28	0.22	1.50	0.26	0.54	0.13	0.46	0.12
25%	60%	22%	15%	1.09	0.14	1.48	0.20	1.73	0.23	0.74	0.20	0.58	0.12
30%	66%	29%	19%	1.19	0.11	1.63	0.15	1.91	0.17	0.97	0.24	0.73	0.15
35%	71%	39%	23%	1.29	0.09	1.75	0.12	2.05	0.14	1.31	0.34	0.89	0.15
40%	75%	51%	27%	1.36	0.07	1.85	0.10	2.17	0.12	1.71	0.40	1.04	0.15
45%	79%	62%	32%	1.43	0.07	1.95	0.10	2.28	0.12	2.08	0.37	1.24	0.19
50%	82%	70%	38%	1.48	0.05	2.03	0.07	2.37	0.09	2.35	0.27	1.47	0.23
55%	84%	76%	45%	1.52	0.04	2.07	0.05	2.43	0.06	2.55	0.20	1.74	0.27
60%	86%	81%	57%	1.56	0.04	2.12	0.05	2.49	0.06	2.72	0.17	2.20	0.46
65%	88%	85%	70%	1.59	0.04	2.17	0.05	2.54	0.06	2.86	0.13	2.70	0.50
70%	90%	88%	79%	1.63	0.04	2.22	0.05	2.60	0.06	2.96	0.10	3.05	0.35
75%	92%	91%	85%	1.67	0.04	2.27	0.05	2.66	0.06	3.06	0.10	3.28	0.23
80%	94%	93%	89%	1.70	0.04	2.32	0.05	2.72	0.06	3.12	0.07	3.44	0.15
85%	96%	95%	92%	1.74	0.04	2.37	0.05	2.77	0.06	3.19	0.07	3.55	0.12
90%	97%	97%	95%	1.76	0.02	2.40	0.02	2.80	0.03	3.26	0.07	3.67	0.12
95%	98%	98%	97%	1.77	0.02	2.42	0.02	2.83	0.03	3.29	0.03	3.74	0.08
100%	100%	100%	100%	1.81	0.04	2.47	0.05	2.89	0.06	3.36	0.07	3.86	0.12

Exhibit C - 1
Median Time Distributions of Heavy Storm Rainfall at a Point
25-year event
City of New Berlin

Time	First quartile	Second quartile	Third quartile	1-hr.		3-hr.		6-hr.		12-hr.		24-hr.	
				2.19		2.98		3.49		4.05		4.66	
0%	0%	0%	0%	0.00		0.00		0.00		0.00		0.00	
5%	16%	3%	3%	0.35	0.35	0.48	0.48	0.56	0.56	0.12	0.12	0.14	0.14
10%	33%	8%	6%	0.72	0.37	0.98	0.51	1.15	0.59	0.32	0.20	0.28	0.14
15%	43%	12%	9%	0.94	0.22	1.28	0.30	1.50	0.35	0.49	0.16	0.42	0.14
20%	52%	16%	12%	1.14	0.20	1.55	0.27	1.81	0.31	0.65	0.16	0.56	0.14
25%	60%	22%	15%	1.31	0.18	1.79	0.24	2.09	0.28	0.89	0.24	0.70	0.14
30%	66%	29%	19%	1.45	0.13	1.97	0.18	2.30	0.21	1.17	0.28	0.89	0.19
35%	71%	39%	23%	1.55	0.11	2.12	0.15	2.48	0.17	1.58	0.41	1.07	0.19
40%	75%	51%	27%	1.64	0.09	2.24	0.12	2.62	0.14	2.07	0.49	1.26	0.19
45%	79%	62%	32%	1.73	0.09	2.35	0.12	2.76	0.14	2.51	0.45	1.49	0.23
50%	82%	70%	38%	1.80	0.07	2.44	0.09	2.86	0.10	2.84	0.32	1.77	0.28
55%	84%	76%	45%	1.84	0.04	2.50	0.06	2.93	0.07	3.08	0.24	2.10	0.33
60%	86%	81%	57%	1.88	0.04	2.56	0.06	3.00	0.07	3.28	0.20	2.66	0.56
65%	88%	85%	70%	1.93	0.04	2.62	0.06	3.07	0.07	3.44	0.16	3.26	0.61
70%	90%	88%	79%	1.97	0.04	2.68	0.06	3.14	0.07	3.56	0.12	3.68	0.42
75%	92%	91%	85%	2.01	0.04	2.74	0.06	3.21	0.07	3.69	0.12	3.96	0.28
80%	94%	93%	89%	2.06	0.04	2.80	0.06	3.28	0.07	3.77	0.08	4.15	0.19
85%	96%	95%	92%	2.10	0.04	2.86	0.06	3.35	0.07	3.85	0.08	4.29	0.14
90%	97%	97%	95%	2.12	0.02	2.89	0.03	3.39	0.03	3.93	0.08	4.43	0.14
95%	98%	98%	97%	2.15	0.02	2.92	0.03	3.42	0.03	3.97	0.04	4.52	0.09
100%	100%	100%	100%	2.19	0.04	2.98	0.06	3.49	0.07	4.05	0.08	4.66	0.14

Exhibit C - 1
Median Time Distributions of Heavy Storm Rainfall at a Point
100-year Event
City of New Berlin

Time	First quartile	Second quartile	Third quartile	1-hr.		3-hr.		6-hr.		12-hr.		24-hr.	
				2.93		3.62		4.68		5.43		6.24	
0%	0%	0%	0%	0.00		0.00		0.00		0.00		0.00	
5%	16%	3%	3%	0.47	0.47	0.58	0.58	0.75	0.75	0.16	0.16	0.19	0.19
10%	33%	8%	6%	0.97	0.50	1.19	0.62	1.54	0.80	0.43	0.27	0.37	0.19
15%	43%	12%	9%	1.26	0.29	1.56	0.36	2.01	0.47	0.65	0.22	0.56	0.19
20%	52%	16%	12%	1.52	0.26	1.88	0.33	2.43	0.42	0.87	0.22	0.75	0.19
25%	60%	22%	15%	1.76	0.23	2.17	0.29	2.81	0.37	1.19	0.33	0.94	0.19
30%	66%	29%	19%	1.93	0.18	2.39	0.22	3.09	0.28	1.57	0.38	1.19	0.25
35%	71%	39%	23%	2.08	0.15	2.57	0.18	3.32	0.23	2.12	0.54	1.44	0.25
40%	75%	51%	27%	2.20	0.12	2.72	0.14	3.51	0.19	2.77	0.65	1.68	0.25
45%	79%	62%	32%	2.31	0.12	2.86	0.14	3.70	0.19	3.37	0.60	2.00	0.31
50%	82%	70%	38%	2.40	0.09	2.97	0.11	3.84	0.14	3.80	0.43	2.37	0.37
55%	84%	76%	45%	2.46	0.06	3.04	0.07	3.93	0.09	4.13	0.33	2.81	0.44
60%	86%	81%	57%	2.52	0.06	3.11	0.07	4.02	0.09	4.40	0.27	3.56	0.75
65%	88%	85%	70%	2.58	0.06	3.19	0.07	4.12	0.09	4.62	0.22	4.37	0.81
70%	90%	88%	79%	2.64	0.06	3.26	0.07	4.21	0.09	4.78	0.16	4.93	0.56
75%	92%	91%	85%	2.70	0.06	3.33	0.07	4.31	0.09	4.94	0.16	5.30	0.37
80%	94%	93%	89%	2.75	0.06	3.40	0.07	4.40	0.09	5.05	0.11	5.55	0.25
85%	96%	95%	92%	2.81	0.06	3.48	0.07	4.49	0.09	5.16	0.11	5.74	0.19
90%	97%	97%	95%	2.84	0.03	3.51	0.04	4.54	0.05	5.27	0.11	5.93	0.19
95%	98%	98%	97%	2.87	0.03	3.55	0.04	4.59	0.05	5.32	0.05	6.05	0.12
100%	100%	100%	100%	2.93	0.06	3.62	0.07	4.68	0.09	5.43	0.11	6.24	0.19

Exhibit C - 2
Hydrologic Parameters for Various Land Use
City of New Berlin

	Wetland, Forest, Park	Highway Corridor	Agriculture, Open Space	Residential			Institutional	Commercial	Industrial	Open Water
				Low Density	Medium Density	High Density				
IMPERVIOUS n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.024
PERVIOUS n	0.400	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.060
IMPERVIOUS Ia	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
PERVIOUS Ia	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.10
% IMPERVIOUS	1.0	50.0	1.0	30.0	34.0	57.0	65.0	87.0	87.0	100.0
% DCIA	1.0	25.0	1.0	16.0	19.0	38.0	46.0	79.0	79.0	100.0
% NDCIA	0.0	25.0	0.0	14.0	15.0	19.0	19.0	8.0	8.0	0.0
% PERVIOUS	99.0	50.0	99.0	70.0	66.0	43.0	35.0	13.0	13.0	0.0
CHECK %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Exhibit C-3

Unit Runoff Coefficients

The primary storm water system was evaluated using the SWMM computer model. The SWMM model was used to evaluate directly; approximately 200 that were explicitly incorporated in the model. The SWMM model results were also used to estimate flows at more than 500 culverts in the minor storm water system. Unit runoff coefficients in cfs/acre were calculated for each subwatershed by averaging the SWMM model results. These coefficients were derived for both the 10-year and 100-year storm events. These calculations are shown in the attached table.

Exhibit C - 3
Derivations of Unit Runoff Coefficient
City of New Berlin

NEW BERLIN - RUNOFF PER ACRE						
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
CALHOUN CREEK	4A010	125.30	96.82	0.77	61.97	0.49
	4A020	180.30	156.82	0.87	98.11	0.54
	4A030	88.20	101.10	1.15	70.20	0.80
	4B010	250.50	418.88	1.67	246.60	0.98
	4B020	224.90	245.39	1.09	139.34	0.62
	4C010	756.50	876.47	1.16	522.22	0.69
	4C020	74.00	213.45	2.88	121.99	1.65
	4C030	345.90	650.29	1.88	372.75	1.08
	4C040	224.10	468.18	2.09	261.87	1.17
	4C050	84.00	91.37	1.09	56.48	0.67
	4C060	182.20	210.74	1.16	113.58	0.62
	4C070	408.90	392.62	0.96	220.20	0.54
	4C080	74.00	129.78	1.75	100.87	1.36
	4C085	47.00	80.11	1.70	62.10	1.32
	4C090	28.90	71.79	2.48	44.30	1.53
	4D010	133.80	208.55	1.56	141.53	1.06
	4E 010	317.40	654.56	2.06	367.90	1.16
	4E 020	21.30	56.35	2.65	36.01	1.69
	4E 030	600.60	927.87	1.54	548.02	0.91
	4E 040	42.70	90.36	2.12	62.54	1.46
	4E 050	29.90	105.12	3.52	64.58	2.16
	4E 060	256.20	809.14	3.16	473.04	1.85
	SUMS	4496.60	7055.76	39.31	4186.20	24.37
	AVERAGES	204.39	320.72	1.79	190.28	1.11
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
POPLAR CREEK	6A010	610.60	1032.06	1.69	467.16	0.77
	6A011	405.20	601.60	1.48	257.10	0.63
	6A020	313.10	522.82	1.67	252.46	0.81
	6A021	136.60	323.96	2.37	162.07	1.19
	6A022	71.20	207.10	2.91	94.12	1.32
	6A023	333.10	351.55	1.06	154.10	0.46
	6A030	108.20	234.58	2.17	109.04	1.01
	6A040	159.90	173.82	1.09	77.12	0.48
	6A041	372.90	781.54	2.10	391.01	1.05
	6A042	78.30	200.30	2.56	93.10	1.19
	6A043	44.10	173.51	3.93	89.97	2.04
	6A044	79.70	295.31	3.71	150.04	1.88
	6A050	92.50	78.84	0.85	33.10	0.36
	6A060	567.90	649.24	1.14	288.36	0.51
	6A070	116.80	164.22	1.41	72.82	0.62
	6A071	680.80	925.35	1.36	403.34	0.59
	6A072	786.60	746.78	0.95	334.62	0.43
	6B010	311.20	562.32	1.81	276.66	0.89
	6B020	930.90	1600.68	1.72	763.97	0.82
	6B030	325.90	616.06	1.89	271.77	0.83
	6B040	210.20	165.32	0.79	67.06	0.32
	6B050	119.60	97.96	0.82	39.74	0.33
	6C010	762.00	1114.99	1.46	546.42	0.72
	6C020	317.40	569.89	1.80	260.79	0.82

Exhibit C - 3
Derivations of Unit Runoff Coefficient
City of New Berlin

	6C021	171.30	182.21	1.06	76.82	0.45
	6C022	470.70	491.90	1.05	217.99	0.46
	6D010	251.90	414.93	1.65	180.81	0.72
	6D020	91.10	153.56	1.69	69.74	0.77
	6F010	38.40	104.25	2.71	48.81	1.27
	SUMS	8958.10	13536.65	50.88	6250.11	23.73
	AVERAGES	308.90	466.78	1.75	215.52	0.82
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
UPPER ROOT RIVER	2A010	101.10	108.03	1.07	34.93	0.35
	2A015	64.60	115.69	1.79	34.45	0.53
	2A020	105.30	232.02	2.20	80.50	0.76
	2A030	148.00	272.23	1.84	83.77	0.57
	2A040	79.70	172.06	2.16	61.24	0.77
	2A050	189.80	262.51	1.38	101.08	0.53
	2A060	295.20	426.67	1.45	172.16	0.58
	2B010	106.20	183.35	1.73	63.17	0.59
	2B012	22.30	62.63	2.81	19.54	0.88
	2B013	25.60	56.90	2.22	19.23	0.75
	2B014	67.40	253.55	3.76	75.03	1.11
	2B015	42.70	108.08	2.53	32.16	0.75
	2B020	83.50	235.43	2.82	80.65	0.97
	2B030	75.90	181.16	2.39	55.37	0.73
	2B040	68.30	154.72	2.27	49.06	0.72
	2B050	249.10	604.73	2.43	244.31	0.98
	2B060	248.60	598.56	2.41	230.79	0.93
	2C010	200.70	390.96	1.95	158.84	0.79
	2D010	162.30	257.95	1.59	103.44	0.64
	2D020	265.20	372.82	1.41	150.01	0.57
	2D030	75.10	170.49	2.27	56.18	0.75
	2D031	33.20	65.54	1.97	19.59	0.59
	2D032	52.70	110.91	2.10	34.76	0.66
	2D040	173.60	329.71	1.90	131.44	0.76
	2E 010	189.30	290.45	1.53	104.77	0.55
	2E 011	98.20	149.29	1.52	60.66	0.62
	2E 020	116.70	226.65	1.94	77.41	0.66
	2E 030	39.90	90.15	2.26	27.05	0.68
	2E 040	11.40	28.98	2.54	7.98	0.70
	2E 050	42.70	104.25	2.44	30.45	0.71
	2E 060	169.40	328.84	1.94	111.80	0.66
	2E 070	64.10	263.00	4.10	98.96	1.54
	2E 071	18.50	50.15	2.71	14.61	0.79
	2E 080	129.00	241.44	1.87	91.55	0.71
	2E 090	155.10	244.85	1.58	88.39	0.57
	2F010	135.20	193.45	1.43	79.96	0.59
	SUM	4105.60	7938.20	76.31	2885.29	26.04
	AVERAGES	114.04	220.51	2.12	80.15	0.72
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
UNDERWOOD CREEK	1A010	160.40	354.40	2.21	158.32	0.99
	1A020	71.20	165.81	2.33	74.32	1.04
	1A030	128.10	280.86	2.19	133.15	1.04
	1A031	179.60	304.23	1.69	147.74	0.82

Exhibit C - 3
Derivations of Unit Runoff Coefficient
City of New Berlin

	1A032	128.10	311.91	2.43	142.20	1.11
	SUM	667.40	1417.21	10.86	655.73	5.00
	AVERAGES	133.48	283.44	2.17	131.15	1.00
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
DEER CREEK	3A010	345.90	451.35	1.30	218.52	0.63
	3A020	210.80	404.02	1.92	195.73	0.93
	3A031	60.00	207.90	3.47	104.05	1.73
	3A032	169.40	525.06	3.10	261.27	1.54
	3A033	212.90	520.15	2.44	256.89	1.21
	3A040	271.40	419.10	1.54	201.98	0.74
	3A041	10.00	45.78	4.58	24.17	2.42
	3A042	121.00	229.00	1.89	112.34	0.93
	3A043	123.40	373.21	3.02	185.14	1.50
	3A044	127.20	349.15	2.74	173.97	1.37
	3A050	122.40	307.51	2.51	153.45	1.25
	3A060	216.80	388.24	1.79	190.59	0.88
	3A070	429.80	707.87	1.65	349.51	0.81
	3A080	173.60	329.96	1.90	163.33	0.94
	SUM	2594.60	5258.30	33.86	2590.94	16.89
	AVERAGES	185.33	375.59	2.42	185.07	1.21
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
MILL CREEK	7A010	11.40	12.18	1.07	4.47	0.39
	7B010	247.70	190.87	0.77	81.93	0.33
	7B020	153.70	242.25	1.58	112.59	0.73
	7B030	1117.30	762.15	0.68	366.8	0.33
	7B040	207.80	200.07	0.96	93.66	0.45
	7C010	281.80	336.53	1.19	161.08	0.57
	7D010	372.90	984.52	2.64	496.08	1.33
	SUM	2392.60	2728.57	8.89	1316.61	4.14
	AVERAGES	598.15	389.80	1.27	188.09	0.59
SUBBASIN	SUBCATCHMENT	AREA (AC)	100 YR RUNOFF (CFS)	100 YR RATE (CFS/AC)	10 YR RUNOFF (CFS)	10 YR RATE (CFS/AC)
TESS CORNERS CREEK	5A010	234.80	197.03	0.84	93.36	0.40
	5A020	1337.90	781.09	0.58	373.43	0.28
	5A030	49.80	71.26	1.43	31.4	0.63
	5A031	84.50	151.4	1.79	71.64	0.85
	SUM	1707.00	1200.78	4.65	569.83	2.16
	AVERAGES	426.75	300.20	1.16	142.46	0.54

Exhibit C-4.1

Culvert Capacity Analysis Approach

Culvert capacity depends on entrance conditions, bottom slope, upstream water level (headwater), downstream water level (tailwater), barrel material, opening size and shape. In this capacity analysis, all culverts are assumed to be free of damage, distortion or debris.

Analysis of culvert capacity is extremely complex. A full treatment of the subject may be found in "Measurement of peak discharges at culverts by indirect methods" (USGS, 1968), or in "Unsteady flow Solutions" (Franz, 1998). These documents describe six types of flow that can occur in a culvert. Each flow type is calculated by a different procedure and could possibly be the controlling (that is limiting) flow condition that determines the capacity of the storm water system because the channel cross-section upstream or downstream of the culvert has less capacity than the culvert itself. This condition can be detected by the SWMM model but is not part of the minor system analysis.

Of the six types of culvert flow, two of the more common types have been considered in this analysis:

Type 4 flow - The culvert flows full and is submerged at both ends.

Type 6 flow - The culvert flows partly full and is submerged only at the upstream end.
Type 6 is also known as inlet control.

The information required to compute culvert capacity can be measured in the field except the headwater and the tailwater elevations must be assumed based on how the City wishes to define capacity. In this analysis, the headwater elevation was assumed to be one half the pipe depth above the soffit of the culvert barrel. This was selected because a surcharge head of 0.3 to 0.5 pipe diameters is necessary to force the pipe to flow full.

The following outlines the computational procedure used to evaluate the culverts.

1. Assumed Culvert Flow Condition

The following headwater and tailwater elevations were assumed for each culvert. Known quantities include the upstream invert, ZU, the downstream invert, ZD, and the vertical rise or height of the culvert barrel, D. Each culvert was assumed to have 1.0 foot of headwater surcharge.

$$\begin{array}{l} \text{Headwater Elevation} \\ HW = ZU + D + 1.0 \text{ ft} \end{array}$$

$$\begin{array}{l} \text{Tailwater Elevation} \\ TW = ZD + D \end{array}$$

2. Capacity Calculations

The apparent culvert capacity was calculated using both inlet control and barrel control assumptions. The culvert capacity was taken as the smaller of the two calculated flows.

a. Inlet Control

$$Q = C_d A (2gH_0)^{1/2}$$

$$H_0 = HW - 1.0 - D/2$$

$$C_d = 0.6; \text{ Discharge Coefficient}$$

$$A = \text{Area of Culvert Barrel}$$

$$g = 32.15 \text{ ft/s}^2; \text{ gravitational acceleration}$$

b. Barrel Control

$$Q = (C_n / n) A R^{2/3} S^{1/2}$$

$$C_n = \text{Units constant, 1.486 for English units}$$

$$n = \text{Manning roughness coefficient}$$

$$R = \text{Hydraulic Radius ; } D/2 \text{ for circular pipes}$$

$$S = (HW - TW)/L; \text{ Friction (Energy) Slope with } L \text{ as the barrel length}$$

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 Yr (cfs)	10 Yr (cfs)	100 Yr Rate	10 Yr Rate	Contributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
01.03.15	OAK & GRAHAM	15X22	18	15	ACMP	46	808.97	808.62	0.007609	9.50866	21.6	7.7	2.16	0.77	10	1.25	1.7671	9.50866	0.024	810.845	809.87	0.38	0.595	0.01293	0.825	10.27228	5.8129	0.2626	9.5087
01.03.26	OAK LANE	39X60	48	39	ACMP	40	818.46	818.25	0.005250	109.029	86.4	30.8	2.16	0.77	40	3.25	12.566	109.029	0.024	823.335	821.5	1	0.835	0.02088	1.587	178.4504	14.201	1.5671	109.03
01.03.23	OAK & FERGUSON 10' DRAINAGE EASEMENT	39X60	48	39	RCP	73	818.46	812.99	0.074932	109.029	86.4	30.8	2.16	0.77	40	3.25	12.566	109.029	0.013	823.335	816.24	3	4.095	0.0561	1.587	540.0545	42.976	14.353	109.03
01.03.24	OAK & FERGUSON 10' DRAINAGE EASEMENT	39X60	48	39	RCP	29	812.99	812.94	0.001724	109.029	86.4	30.8	2.16	0.77	40	3.25	12.566	109.029	0.013	817.865	816.19	1	0.675	0.02328	1.587	347.8764	27.683	5.9555	109.03
01.03.16	OAK LANE	24X36	30	24	ACMP	33	819.05	818.25	0.024242	33.41	86.4	30.8	2.16	0.77	40	2	4.9087	33.41	0.024	822.05	820.25	0.9	0.9	0.02727	1.16	58.24363	11.865	1.0941	33.41
01.03.17	OAK LANE	24X36	30	24	ACMP	18	818.46	817.8	0.036667	33.2512	86.4	30.8	2.16	0.77	40	2	4.9087	33.41	0.024	821.46	819.8	1.5	0.16	0.00889	1.16	33.25125	6.7739	0.3566	33.251
01.03.30	FERGUSON	36	36	36	CMP	35	814.65	808.99	0.161714	58.923	108	38.5	2.16	0.77	50	3	7.0686	58.923	0.024	819.15	811.99	5	2.16	0.06171	1.31	142.4712	20.156	3.157	58.923
01.03.31	FERGUSON	36	36	36	CMP	35	814.8	808.91	0.168286	58.923	108	38.5	2.16	0.77	50	3	7.0686	58.923	0.024	819.3	811.91	4	3.39	0.09686	1.31	178.4843	45.25	4.9548	58.923
01.03.14	OAK & GRAHAM	28X42	36	28	ACMP	53	823.55	823.33	0.004151	51.9652	64.8	23.1	2.16	0.77	30	2.3333	7.0686	51.9652	0.024	827.05	825.66	0.75	0.637	0.01201	1.31	62.85681	8.8924	0.6145	51.965
01.03.18	OAK & BRIARWOOD	24X36	30	24	ACMP	40	824.5	823.39	0.027750	33.41	64.8	23.1	2.16	0.77	30	2	4.9087	33.41	0.024	827.5	825.39	0.025	2.085	0.05213	1.16	80.52064	16.404	2.091	33.41
01.03.19	OAK & BRIARWOOD	24X37	30	24	ACMP	40	826.99	824.5	0.062250	33.41	64.8	23.1	2.16	0.77	30	2	4.9087	33.41	0.024	829.99	826.5	1.75	1.74	0.0435	1.16	73.55781	14.985	1.745	33.41
01.03.13	PARK CT	28X42	36	28	CMP	26	831.37	828.05	0.127692	51.9652	64.8	23.1	2.16	0.77	30	2.3333	7.0686	51.9652	0.024	834.87	830.38	3	1.487	0.05718	1.31	137.1369	19.401	2.925	51.965
01.04.11	PARK 20' DRAINAGE EASEMENT	24	24	24	CMP	160	804.53	801.17	0.021000	21.3824	21.6	7.7	2.16	0.77	10	2	3.1416	21.3824	0.024	807.53	803.17	1.11	3.25	0.02031	1	27.72293	8.8245	0.6052	21.382
01.03.05	ELM GROVE	33X48	42	33	ACMP	52	796.42	795.84	0.011154	76.7864	86.4	30.8	2.16	0.77	40	2.75	9.6211	76.7864	0.024	800.545	798.59	1.05	0.905	0.0174	1.452	114.1252	11.862	1.0935	76.786
01.03.06	ELM GROVE	48	48	48	CMP	54	796.8	795.42	0.025556	120.957	64.8	23.1	2.16	0.77	30	4	12.566	120.957	0.024	802.8	799.42	2	1.38	0.02556	1.587	197.4453	15.712	1.9185	120.96
01.03.20	FOREST & OAK	24X36	30	24	ACMP	49	820.26	820.16	0.002041	33.41	64.8	23.1	2.16	0.77	30	2	4.9087	33.41	0.024	823.26	822.16	0.5	0.6	0.01224	1.16	39.02669	7.9505	0.4912	33.41
01.03.21	FOREST & OAK	24X36	30	24	ACMP	36	820	819.96	0.001111	33.41	64.8	23.1	2.16	0.77	30	2	4.9087	33.41	0.024	823	821.96	0.5	0.54	0.015	1.16	43.19463	8.7995	0.6017	33.41
01.03.07	PARKWAY	24	24	24	RCP	99.5	800.07	794.95	0.051457	21.3824	21.6	7.7	2.16	0.77	10	2	3.1416	21.3824	0.013	803.07	796.95	0.9	5.22	0.05246	1	82.25249	26.182	5.3271	21.382
01.03.02	OAK CT 20' DRAINAGE EASEMENT	24	24	24	CMP	174	808.98	796.8	0.070000	21.3824	43.2	15.4	2.16	0.77	20	2	3.1416	21.3824	0.024	811.98	798.8	1.25	11.93	0.06856	1	50.93344	16.213	2.0427	21.382
01.03.25	HONEY	15X27	22	15	CMP	34	834.8	834.39	0.012059	14.2043	21.6	7.7	2.16	0.77	10	1.25	2.6398	14.2043	0.024	836.675	835.64	0.5	0.535	0.01574	0.944	19.34752	7.3291	0.4174	14.204
01.02.36	PROSPECT & BERLIN	21	21	21	RCP	96	829.92	823.78	0.063958	15.3136	48.6	22.2	2.43	1.11	20	1.75	2.4053	15.3136	0.013	832.545	831.67	0.001	0.874	0.00091	0.915	23.99939	9.9778	0.7737	15.314
01.02.20	BERLIN	21	21	21	RCP	110	823.78	823.67	0.001000	15.3136	48.6	22.2	2.43	1.11	20	1.75	2.4053	15.3136	0.013	826.405	825.53	0.05	0.255	0.00477	0.915	17.37654	9.2243	0.4056	15.314
01.02.16	MEADOW	24X36	30	24	ACMP	60	781.3	780.73	0.009500	33.41	48.6	22.2	2.43	1.11	20	2	4.9087	33.41	0.024	784.3	782.73	0.64	0.93	0.0155	1.16	43.90864	8.945	0.6218	33.41
01.01.10	MEADOW	30X40	36	30	ACMP	41	778.24	777.63	0.014878	53.7891	48.6	22.2	2.43	1.11	20	2.5	7.0686	53.7891	0.024	781.99	780.13	1.11	0.75	0.01829	1.31	77.56627	10.973	0.9358	53.789
01.01.12	MEADOW	39X72	60	39	ACMP	31	776.97	776.76	0.006774	170.358	48.6	22.2	2.43	1.11	20	3.25	19.635	170.358	0.024	781.845	780.01	1.45	0.385	0.01242	1.842	249.5631	12.71	1.2554	170.36
01.02.27	PROSPECT PLACE & MILTON	17X42	26	17	ACMP	35	813.37	810.33	0.086857	21.1203	97.2	44.4	2.43	1.11	40	1.4167	3.687	21.1203	0.024	815.495	811.75	1.25	2.498	0.07138	1.055	64.33504	17.449	2.3661	21.12
01.02.15	PROSPECT & BERLIN	21	21	21	CMP	27	830.53	830.28	0.009259	15.3136	48.6	22.2	2.43	1.11	20	1.75	2.4053	15.3136	0.024	833.155	832.03	0.54	0.585	0.02167	0.915	20.05434	8.3376	0.5402	15.314
01.02.11	PROSPECT & PARKVIEW	24X30	26	24	ACMP	35	827.58	827.35	0.006571	25.0946	48.6	22.2	2.43	1.11	20	2	3.687	25.0946	0.024	830.58	829.35	0.62	0.61	0.01743	1.055	31.78976	8.6221	0.5777	25.095
01.02.10	ARCADIAN	42X72	60	42	CMPA	32	797.49	797.06	0.013438	176.789	48.6	22.2	2.43	1.11	20	3.5	19.635	176.789	0.024	802.74	800.56	1.24	0.94	0.02938	1.842	383.8132	19.547	2.9694	176.79
01.03.24	GREENFIELD & ELM GROVE	24	24	24	CMPA	53	800.86	799.61	0.023585	21.3824	86.51	39.52	2.43	1.11	35.6	2	3.1416	21.3824	0.024	803.86	801.61	0.75	1.5	0.0283	1	32.72391	10.416	0.8432	21.382
01.02.03	GREENFIELD	36	36	36	CMP	74	805.29	801.76	0.047703	58.923	86.51	39.52	2.43	1.11	35.6	3	7.0686	58.923	0.024	809.79	804.76	1.24	3.79	0.05122	1.31	129.789	18.361	2.62	58.923
01.02.09	PROSPECT & ELM GROVE	24	24	24	CMP	40	807.62	807.09	0.013250	21.3824	88.4	39.6	2.21	0.99	40	2	3.1416	21.3824	0.024	810.62	809.09	0.12	1.41	0.03525	1	36.52052	11.625	1.0502	21.382
01.01.04	PROSPECT & CONRAD	24	24	24	CMP	43	770.92	771.75	0.019302	10.2758	44.2	19.8	2.21	0.99	20	2	3.1416	21.3824	0.024	773.92	773.75	0.05	0.12	0.00279	1	10.27576	3.2709	0.0831	10.276
01.02.14	PROSPECT & 124th	30	30	30	CMP	30	760.57	760.57	0.000000	37.3535	176.8	79.2	2.21	0.99	80	2.5	4.9087	37.3535	0.024	764.32	763.07	0.75	0.5	0.01667	1.16	45.53114	9.2755	0.6686	37.354
01.01.09	CONRAD & MEADOW	37	37	37	CMP	24	760.74	760.73	0.000417	63.1005	88.4	39.6	2.21	0.99	40	3.0833	7.4667	63.1005	0.024	765.365	763.81	1.12	0.432	0.01799	1.335	82.74354	11.082	0.9543	63.101
01.01.08	ELM GROVE & WEST NEEDHAM	50	50	50	RCP	41.86	782.69	779.54	0.075251	133.953	44.2	19.8	2.21	0.99	20	4.1667	13.635	133.953	0.013	788.94	783.71	0.5	4.733	0.11308	1.631	854.9343	62.7	30.551	133.95
01.01.12	ELM GROVE & WEST NEEDHAM (meadow)	39X72	54	39	CONC	30.61	776.97	776.76	0.006861	137.99	44.2	19.8	2.21	0.99	20	3.25	15.904	137.99	0.013	781.845	780.01	1.25	0.585	0.01911	1.717	431.544	27.134	5.7215	137.99
01.01.10	ELM GROVE & WEST NEEDHAM	30X40	36	30	ACMP	41.5	778.24	777.63	0.014699	53.7891	44.2	19.8	2.21	0.99	20	2.5	7.0686	53.7891	0.024	781.99	780.13	0.24	1.62	0.03904	1.31	113.3098	16.403	1.9969	53.789
01.01.11	GREENFIELD & ELM GROVE	24	24	24	CMP	52.85	765.72	764.41	0.024787	21.3824	88.4	39.6	2.21	0.99	40	2	3.1416	21.3824	0.024	768.72	766.41	0.5	1.81	0.03425	1	35.99766	11.658	1.0203	21.382
01.01.13	GREENFIELD	24X36	30	24	RCP	75	791.02	790.42	0.008000	33.41	66.3	29.7	2.21	0.99	30	2	4.9087	33.41	0.013	7									

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
02.01.18	GREENFIELD BROOKFIELD/NB BORDER	24	24	24	PVC	50	832.95	832.61	0.006800	21.3824	50.7	24.6	1.69	0.82	30	2	3.1416	21.3824	0.009	835.95	834.61	0.5	0.84	0.0168	1	67.23274	21.401	3.5592	21.382
02.01.19	GREENFIELD BROOKFIELD/NB BORDER	24	24	24	PVC	50	832.61	832.13	0.009600	21.3824	50.7	24.6	1.69	0.82	30	2	3.1416	21.3824	0.009	835.61	834.13	0.54	0.94	0.0188	1	71.12219	22.639	3.9829	21.382
02.01.20	GREENFIELD & RANCH	36	36	36	RCP	200	829.06	829	0.000300	58.923	101.4	49.2	1.69	0.82	60	3	7.0686	58.923	0.013	833.56	832	0.34	1.22	0.0061	1.31	82.69627	11.699	1.0636	58.923
02.01.28	GREENFIELD & RANCH	42	42	42	CMP	43	832.64	832.61	0.000698	86.6267	169	82	1.69	0.82	100	3.5	9.6211	86.6267	0.024	837.89	836.11	1.26	0.52	0.01209	1.452	95.13196	9.8878	0.7598	86.627
02.01.35	GREENFIELD	24	24	24	CMP	55	834.23	833.69	0.009818	21.3824	16.9	8.2	1.69	0.82	10	2	3.1416	21.3824	0.024	837.23	835.69	0.53	1.01	0.01836	1	26.35948	8.3905	0.5471	21.382
02.02.01	GREENFIELD	24	24	24	CMP	55	840.5	839.39	0.020182	21.3824	33.8	16.4	1.69	0.82	20	2	3.1416	21.3824	0.024	843.5	841.39	0.64	1.47	0.02673	1	31.80056	10.122	0.7963	21.382
02.03.01	MOORLAND & C&NW RR	24	24	24	CMP	138	859.2	857.83	0.009928	21.3824	38.4	18.6	1.92	0.93	20	2	3.1416	21.3824	0.024	862.2	859.83	0.45	1.92	0.01391	1	22.94397	7.3033	0.4145	21.382
02.03.04	ROGERS & VALLEY SPRING	24X36	30	24	ACMP	41	853.64	853.16	0.011707	33.41	27.6	10.6	1.38	0.53	20	2	4.9087	33.41	0.024	856.64	855.16	0.73	0.75	0.01829	1.16	47.70049	9.7175	0.7338	33.41
02.03.10	WOODSHIRE & ROGERS	24X36	30	24	ACMP	45	842.08	842.01	0.001556	33.41	19.2	9.3	1.38	0.53	10	2	4.9087	33.41	0.024	845.08	844.01	0.51	0.56	0.01244	1.16	39.3434	8.015	0.4992	33.41
02.04.03	HONEY	24X36	30	24	ACMP	38	839.05	838.76	0.007632	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	842.05	840.76	0.65	0.64	0.01684	1.16	45.77015	9.3242	0.6756	33.41
02.04.01	HONEY & ROGERS	24X36	30	24	ACMP	91	839.86	839.26	0.006593	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	842.86	841.26	0.35	1.25	0.01374	1.16	41.33505	8.4207	0.551	33.41
02.04.02	HONEY & ROGERS	24X36	30	24	ACMP	39	841.39	841.08	0.007949	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	844.39	843.08	0.75	0.56	0.01436	1.16	42.2616	8.6095	0.576	33.41
02.03.08	HONEY & ROGERS	24X36	30	24	ACMP	39	841.2	840.85	0.008974	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	844.2	842.85	0.69	0.66	0.01692	1.16	45.88005	9.3466	0.6789	33.41
02.04.21	CREST VIEW	24X36	30	24	CMP	42	847.84	847.82	0.000476	33.41	87	34.8	1.45	0.58	60	2	4.9087	33.41	0.024	850.84	849.82	0.5	0.52	0.01238	1.16	39.24291	7.9945	0.4967	33.41
02.04.12	CREST VIEW	24X36	30	24	CMP	128	848.28	847.63	0.005078	33.41	87	34.8	1.45	0.58	60	2	4.9087	33.41	0.024	851.28	849.63	0.4	1.25	0.00977	1.16	34.85252	7.1001	0.3918	33.41
02.04.13	WOODLAND	24X36	30	24	ACMP	46	847.12	847.02	0.002174	33.41	101.5	40.6	1.45	0.58	70	2	4.9087	33.41	0.024	850.12	849.02	0.51	0.59	0.01283	1.16	39.94213	8.1369	0.5145	33.41
02.04.04	HONEY & PARKWOOD	24	24	24	ACMP	43	835.32	834.71	0.014186	21.3824	55.2	21.2	1.38	0.53	40	2	3.1416	21.3824	0.024	838.32	836.71	0.67	0.94	0.02186	1	28.75988	9.1546	0.6513	21.382
02.04.05	HONEY & PARKWOOD	24	24	24	ACMP	43	835.32	834.9	0.009767	21.3824	55.2	21.2	1.38	0.53	40	2	3.1416	21.3824	0.024	838.32	836.9	0.58	0.84	0.01953	1	27.1871	8.6539	0.582	21.382
02.04.17	HONEY & PARKWOOD 20' DRAINAGE	60	60	60	RCP	47	830.06	829.91	0.003191	211.303	110.4	42.4	1.38	0.53	80	5	19.635	211.303	0.013	837.56	834.91	2.25	0.4	0.00851	1.842	381.3993	19.425	2.9322	211.3
02.04.08	PARKWOOD	24X36	30	24	ACMP	44	832.29	829.91	0.054091	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	835.29	831.91	1.5	1.88	0.04273	1.16	72.90155	14.851	1.714	33.41
02.03.10	WOODSHIRE & ROGERS	24X36	30	24	ACMP	45	842.08	842.01	0.001556	33.41	55.2	21.2	1.38	0.53	40	2	4.9087	33.41	0.024	845.08	844.01	0.5	0.57	0.01267	1.16	39.69313	8.0862	0.5081	33.41
02.04.28	LINCOLN & BROOKLAND	24X32	28	24	ACMP	57	848.42	845.87	0.044737	29.1038	87	34.8	1.45	0.58	60	2	4.2761	29.1038	0.024	851.42	847.87	1.12	2.43	0.04263	1.108	60.58261	14.168	1.5599	29.104
02.04.26	LINCOLN & MEADOWMERE	18X30	24	18	ACMP	46	842.71	842.05	0.014348	18.5177	87	34.8	1.45	0.58	60	1.5	3.1416	18.5177	0.024	844.96	843.55	0.54	0.87	0.01891	1	26.75088	8.5151	0.5635	18.518
03.02.58	GREENFIELD & S.171st.	24	24	24	CMP	50	870.48	869.88	0.012000	21.3824	43.8	21.6	1.46	0.72	30	2	3.1416	21.3824	0.024	873.48	871.88	0.58	1.02	0.0204	1	27.78258	8.8435	0.6078	21.382
03.02.03	FULLERTON BETWEEN 171ST & CALHOUN	18X30	24	18	CMP	279	868.02	866.86	0.004158	15.0041	29.2	14.4	1.46	0.72	20	1.5	3.1416	18.5177	0.024	870.27	868.36	0.25	1.66	0.00595	1	15.00408	4.7759	0.1773	15.004
03.02.38	ROOSEVELT & S.170th	18X30	24	18	ACMP	42	844.72	844.57	0.003571	18.5177	13	6.3	1.3	0.63	10	1.5	3.1416	18.5177	0.024	846.97	846.07	0.34	0.56	0.01333	1	22.46088	7.1495	0.3972	18.518
03.02.39	ROOSEVELT & S.169th	18X30	24	18	ACMP	43	841.04	841.02	0.000465	18.5177	26	12.6	1.3	0.63	20	1.5	3.1416	18.5177	0.024	843.29	842.52	0.24	0.53	0.01233	1	21.59539	6.874	0.3672	18.518
03.02.41	ROOSEVELT & S.168th	24X36	30	24	ACMP	43	839.89	839.13	0.017674	33.41	65	31.5	1.3	0.63	50	2	4.9087	33.41	0.024	842.89	841.13	0.85	0.91	0.02116	1.16	51.30629	10.452	0.849	33.41
03.02.29	ADDISON &168th	18X27	24	18	ACMP	324	851.38	846.69	0.014475	18.5177	39	18.9	1.3	0.63	30	1.5	3.1416	18.5177	0.024	853.63	848.19	0.47	4.97	0.01534	1	24.09146	7.6686	0.457	18.518
03.02.30	ADDISON &168th	18X27	24	18	ACMP	238	850.33	846.69	0.015294	18.5177	52	25.2	1.3	0.63	40	1.5	3.1416	18.5177	0.024	852.58	848.19	0.51	3.88	0.0163	1	24.83618	7.9056	0.4857	18.518
03.02.42	ROOSEVELT & S. 167th	24X36	30	24	ACMP	43	837.8	837.26	0.012558	33.41	117	56.7	1.3	0.63	90	2	4.9087	33.41	0.024	840.8	839.26	0.78	0.76	0.01767	1.16	46.88746	9.5518	0.709	33.41
03.02.22	ADDISON & S.166th	24	24	24	CMP	42	841.27	841.17	0.002381	21.3824	39	18.9	1.3	0.63	30	2	3.1416	21.3824	0.024	844.27	843.17	0.48	0.62	0.01476	1	23.63353	7.5228	0.4398	21.382
03.02.23	ADDISON & S. 166th	18X27	24	18	ACMP	43	841.21	841.09	0.002791	18.5177	39	18.9	1.3	0.63	30	1.5	3.1416	18.5177	0.024	843.46	842.59	0.32	0.55	0.01279	1	21.99908	7.0025	0.3811	18.518
03.02.24	S.166TH BETWEEN ROOSEVELT & ADDISON	20X30	24	20	ACMP	93	840.86	840.5	0.003871	18.6327	39	18.9	1.3	0.63	30	1.6667	3.1416	19.5194	0.024	843.36	842.17	0.34	0.853	0.00918	1	18.63268	5.931	0.2734	18.633
03.02.21	S.165TH BETWEEN ROOSEVELT & ADDISON	18X30	24	18	ACMP	48	839.47	838.76	0.014792	18.5177	39	18.9	1.3	0.63	30	1.5	3.1416	18.5177	0.024	841.72	840.26	0.55	0.91	0.01896	1	26.78289	8.5253	0.5648	18.518
03.04.04	LINCOLN & S.162nd	24X36	30	24	ACMP	61	845.74	844.44	0.021311	33.41	48.8	24.2	2.44	1.21	20	2	4.9087	33.41	0.024	848.74	846.44	0.85	1.45	0.02377	1.16	54.3755	11.077	0.9536	33.41
03.04.03	S.162nd	24X36	30	24	ACMP	49	842.75	842.86	0.002245	31.0583	48.8	24.2	2.44	1.21	20	2	4.9087	33.41	0.024	845.75	844.86	0.51	0.38	0.00776	1.16	31.05832	6.0271	0.3111	31.058
03.04.02	S.162nd, DRAINAGE EASEMENT	24X36	30	24	ACMP	49	841.85	841.62	0.004694	33.41	48.8	24.2	2.44	1.21	20	2	4.9087	33.41	0.024	844.85	843.62	0.65	0.58	0.01184	1.16	38.37074	7.8168	0.4748	33.41
03.04.01	S.162nd & ROGERS	24X36	30	24	ACMP	61	843.06	842.61	0.007377	33.41	48.8	24.2	2.44	1.21	20	2	4.9087	33.41	0.024	846.06	844.61	0.64	0.81	0.01328	1.16	40.64075	8.2793	0.5327	33.41
03.04.06	W. ROGERS DR	60X240	135	60	CONC	80	844.6	844.5	0.001250	1069.72	869	661	2.44	1.21	600	5	99.402	1069.72	0.013	852.1	849.5	2.35	0.25	0.00313	3.163	2008.988	20.211	3.1743	1069.7
03.04.05	W. ROGERS DR	60X																											

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
03.03.06	LINCOLN AVE UTILITY & RR & DRAINAGE	24X36	30	24	ACMP	25	844.12	843.55	0.022800	33.41	73.2	36.3	2.44	1.21	30	2	4.9087	33.41	0.024	847.12	845.55	0.85	0.72	0.0288	1.16	59.85224	12.193	1.1553	33.41
03.03.07	LINCOLN AVE UTILITY & RR & DRAINAGE	30X42	36	30	ACMP	71	844.12	843.92	0.002817	53.7891	73.2	36.3	2.44	1.21	30	2.5	7.0686	53.7891	0.024	847.87	846.42	0.5	0.95	0.01338	1.31	66.33868	9.385	0.6845	53.789
03.03.08	LINCOLN AVE UTILITY & RR & DRAINAGE	30X42	36	30	ACMP	33	842.94	842.66	0.008485	53.7891	122	60.5	2.44	1.21	50	2.5	7.0686	53.7891	0.024	846.69	845.16	0.95	0.58	0.01758	1.31	76.03109	10.765	0.8991	53.789
03.03.09	LINCOLN AVE UTILITY & RR & DRAINAGE	30X42	36	30	ACMP	33	842.87	842.62	0.007576	53.7891	122	60.5	2.44	1.21	50	2.5	7.0686	53.7891	0.024	846.62	845.12	0.95	0.55	0.01667	1.31	74.03866	10.474	0.8526	53.789
03.03.17	ROGERS	24X36	30	24	ACMP	49	839.29	839.25	0.000816	33.41	73.2	36.3	2.44	1.21	30	2	4.9087	33.41	0.024	842.29	841.25	0.48	0.56	0.01143	1.16	37.70337	7.6809	0.4585	33.41
03.03.23	CALHOUN	24X36	30	24	ACMP	49	854.38	854.19	0.003878	33.41	24.4	12.1	2.44	1.21	10	2	4.9087	33.41	0.024	857.38	856.19	0.5	0.69	0.01408	1.16	41.85147	8.5259	0.5649	33.41
04.04.02	CALHOUN & LINCOLN	24	24	24	CCP	68	863.85	863.17	0.010000	21.3824	27	12.3	1.8	0.82	15	2	3.1416	21.3824	0.024	866.85	865.17	0.35	1.33	0.01956	1	27.20375	8.6592	0.5827	21.382
04.04.03	CALHOUN & LINCOLN	24	24	24	CCP	64	863.97	863.02	0.014844	21.3824	27	12.3	1.8	0.82	15	2	3.1416	21.3824	0.024	866.97	865.02	0.32	1.63	0.02547	1	31.04283	9.8812	0.7588	21.382
04.04.06	WESTWARD	24	24	24	CCP	68	856.16	854.67	0.021912	21.3824	18	8.2	1.8	0.82	10	2	3.1416	21.3824	0.024	859.16	856.67	0.67	1.82	0.02676	1	31.82282	10.13	0.7974	21.382
04.03.01	GREENFIELD	24	24	24	CMP	45	850.34	849.02	0.029333	13.6007	18	8.2	1.8	0.82	10	2	3.1416	21.3824	0.024	853.34	851.02	2.1	0.22	0.00489	1	13.60074	4.3292	0.1457	13.601
04.04.01	GREENFIELD	24	24	24	CMP	45	838.79	832.58	0.138000	21.3824	126	57.4	1.8	0.82	70	2	3.1416	21.3824	0.024	841.79	834.58	0.4	6.81	0.15133	1	75.67018	24.087	4.5086	21.382
04.01.14	2493250E, 373250N	36	48	48	RCP	42	826.55	826.08	0.011190	120.957	116.8	57.6	1.46	0.72	80	4	12.566	120.957	0.013	832.55	830.08	1.75	0.72	0.01714	1.587	298.5477	23.758	4.3863	120.96
04.01.15	2497000E, 372500N	54	54	54	RCP	23	838.12	832.12	0.268070	162.373	146	72	1.46	0.72	100	4.5	15.904	162.373	0.013	844.87	836.62	6.52	1.73	0.07522	1.717	856.1265	53.83	22.518	162.37
04.01.16	2497000E, 372500N	27	27	27	RCP	31	830.05	829.95	0.003226	28.7037	58.4	28.8	1.46	0.72	40	2.25	3.9761	28.7037	0.013	833.425	832.2	0.65	0.575	0.01855	1.082	66.95533	16.84	2.2037	28.704
04.01.17	2497000E, 372500N	27	27	27	RCP	50	828.36	828.13	0.004600	28.7037	58.4	28.8	1.46	0.72	40	2.25	3.9761	28.7037	0.013	831.735	830.38	0.56	0.795	0.0159	1.082	61.99128	15.591	1.889	28.704
04.01.18	2497000E, 372500N	48	48	48	RCP	32	828.58	828.35	0.007188	120.957	116.8	57.6	1.46	0.72	80	4	12.566	120.957	0.013	834.58	832.35	1.75	0.48	0.015	1.587	279.2658	22.223	3.838	120.96
04.01.19	2497000E, 372500N	30	30	30	RCP	77	837.01	831.84	0.067143	37.3535	43.8	21.6	1.46	0.72	30	2.5	4.9087	37.3535	0.013	840.76	834.34	1.2	5.22	0.06779	1.16	169.5282	34.536	9.269	37.354
03.03.01	LINCOLN 2497000E	36	36	36	RCP	33	833.44	833.4	0.001212	58.923	58.4	28.8	1.46	0.72	40	3	7.0686	58.923	0.013	837.94	836.4	0.98	0.56	0.01697	1.31	137.9238	19.512	2.9587	58.923
03.03.02	LINCOLN 2497000E	24	24	24	RCP	40	836.32	836.05	0.006750	21.3824	29.2	14.4	1.46	0.72	20	2	3.1416	21.3824	0.013	839.32	838.05	0.54	0.73	0.01825	1	48.51285	15.442	1.8531	21.382
04.01.13	C & NW RR	18X24	20	18	CPMA	36	838.98	836.05	0.081389	12.8595	116.8	57.6	1.46	0.72	80	1.5	2.1817	12.8595	0.024	841.23	837.55	1.25	2.43	0.0675	0.886	31.07845	14.245	1.577	12.86
04.01.20	C & NW RR	36X48	42	36	STONE	24	838.71	838.63	0.003333	80.2007	116.8	57.6	1.46	0.72	80	3	9.6211	80.2007	0.013	843.21	841.63	1.5	0.08	0.00333	1.452	92.2075	9.5839	0.7138	80.201
04.01.11	WEST LANE	36	36	36	RCP	40	844.86	844.75	0.002750	58.923	58.4	28.8	1.46	0.72	40	3	7.0686	58.923	0.013	849.36	847.75	0.75	0.86	0.02015	1.31	155.2463	21.963	3.7486	58.923
04.02.02	GREENFIELD	36	36	36	CMP	46	837.67	837.36	0.006739	58.923	58.4	28.8	1.46	0.72	40	3	7.0686	58.923	0.024	842.17	840.36	0.85	0.96	0.02087	1.31	82.4969	11.721	1.0676	58.923
04.02.12	CALHOUN	24X36	30	24	ACMP	37	865.41	865.07	0.009189	33.41	87.6	43.2	1.46	0.72	60	2	4.9087	33.41	0.024	868.41	867.07	0.75	0.59	0.01595	1.16	44.53581	9.0728	0.6397	33.41
05.03.04	BTWN LINCOLN & C&NW RR	48	48	48	CMP	35	824.4	824.04	0.010286	120.957	116.8	57.6	1.46	0.72	80	4	12.566	120.957	0.024	830.4	828.04	1.5	0.86	0.02457	1.587	193.6063	15.407	1.8446	120.96
05.03.05	BTWN LINCOLN & C&NW RR	48	48	48	RCP	33	827.36	827.13	0.006970	120.957	438	216	1.46	0.72	300	4	12.566	120.957	0.013	833.36	831.13	1.75	0.48	0.01455	1.587	275.0019	21.884	3.7217	120.96
05.03.06	BTWN LINCOLN & C&NW RR	24	24	24	STEEL	31	829.95	827.92	0.065484	21.3824	14.6	7.2	1.46	0.72	10	2	3.1416	21.3824	0.024	832.95	829.92	1.75	1.28	0.04129	1	39.52588	12.581	1.2301	21.382
05.03.10	BTWN LINCOLN & C&NW RR	24	24	24	STEEL	45	833.5	832.6	0.020000	21.3824	14.6	7.2	1.46	0.72	10	2	3.1416	21.3824	0.024	836.5	834.6	1.25	0.65	0.01444	1	23.37803	7.4415	0.4303	21.382
05.03.07	BTWN LINCOLN & C&NW RR	48	48	48	CONC	34	827.4	827.13	0.007941	120.957	131.4	64.8	1.46	0.72	90	4	12.566	120.957	0.013	833.4	831.13	1.2	1.07	0.03147	1.587	404.5056	32.19	8.0523	120.96
05.03.08	BTWN LINCOLN & C&NW RR	36X65	50	36	STONE	29	827.2	826.46	0.025517	113.663	116.8	57.6	1.46	0.72	80	3	13.635	113.663	0.013	831.7	829.46	2	0.24	0.00828	1.631	231.2892	16.962	2.236	113.66
05.03.09	BTWN LINCOLN & C&NW RR	21	21	21	CCP	20	829.97	829.88	0.004500	15.3136	14.6	7.2	1.46	0.72	10	1.75	2.4053	15.3136	0.013	832.595	831.63	0.54	0.425	0.02125	0.915	36.66567	15.244	1.8058	15.314
05.01.09	GREENFIELD & WESTWOOD	24	24	24	PVC	54	885.74	884.5	0.022963	21.3824	29.2	14.4	1.46	0.72	20	2	3.1416	21.3824	0.024	888.74	886.5	0.75	1.49	0.02759	1	32.31125	10.285	0.822	21.382
05.01.03	PINECREST & BIRCHWOOD	21	21	21	CMP	37	881.23	880.07	0.031351	15.3136	14.6	7.2	1.46	0.72	10	1.75	2.4053	15.3136	0.024	883.855	881.82	0.78	1.255	0.03392	0.915	25.09188	10.432	0.8457	15.314
05.01.07	NORWOOD & BIRCHWOOD	27	27	27	CMP	40	846.19	845.17	0.025500	28.7037	29.2	14.4	1.46	0.72	20	2.25	3.9761	28.7037	0.024	849.565	847.42	0.94	1.205	0.03013	1.082	46.21976	11.624	1.0501	28.704
05.03.10	JOHNSON & EASEMENT	24	24	24	RCP	53	827.36	826.97	0.007358	21.3824	16.9	7.7	1.69	0.77	10	2	3.1416	21.3824	0.013	830.36	828.97	0.5	0.89	0.01679	1	46.53529	14.813	1.7051	21.382
05.02.05	PINECREST	24	24	24	CMP	18	847.4	846.8	0.033333	21.3824	50.7	23.1	1.69	0.77	30	2	3.1416	21.3824	0.024	850.4	848.8	1.12	0.48	0.02667	1	31.76448	10.111	0.7945	21.382
05.02.01	GREENFIELD	42	42	42	CMP	18	857.55	855.92	0.090556	86.6267	84.5	38.5	1.69	0.77	50	3.5	9.6211	86.6267	0.024	862.8	859.42	2.75	0.63	0.035	1.452	161.9427	2.219	86.627	
05.02.02	GREENFIELD	24	24	24	CMP	44	865.65	865.01	0.014545	21.3824	16.9	7.7	1.69	0.77	10	2	3.1416	21.3824	0.024	868.65	867.01	0.67	0.97	0.02205	1	28.88132	9.1932	0.6568	21.382
06.01.15	C&NW RR	72	72	72	CONC	47	827.76	827.67	0.001915	333.319	11680	5760	1.46	0.72	8000	6	28.274	333.319	0.013	836.76	833.67	2.79	0.3	0.00638	2.08	537.1067	18.996	2.8043	333.32
06.01.16	C&NW RR	96	96	96	CONC	42	827.33	827.03	0.000714	684.237	11680	5760	1.46	0.72	8000	8	50.265	684.237	0.013										

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
07.04.01	CLEVELAND & DRAINAGE EASEMENT	64X84	78	64	ACMP	89	848.95	847.98	0.010899	368.814	505.6	204.8	0.79	0.32	640	5.3333	33.183	368.814	0.024	856.95	853.31	2.1	1.537	0.01727	2.194	592.345	17.851	2.4763	368.81
07.02.01	AMOR & CLEVELAND	64X84	78	64	ACMP	79	848.29	847.8	0.006203	368.814	150	50	0.79	0.32	640	5.3333	33.183	368.814	0.024	856.29	853.13	2.1	1.057	0.01338	2.194	521.3572	15.712	1.9183	368.81
07.02.02	AMOR & CLEVELAND	30	30	30	CMP	81	855.78	854.64	0.014074	17.0812	79	32	0.79	0.32	100	2.5	4.9087	37.3535	0.024	859.53	857.14	2.2	0.19	0.00235	1.16	17.0812	3.4798	0.0941	17.081
07.02.03	LINCOLN	72X113	90	72	CMPA	42	835.63	835.47	0.003810	249.551	1185	480	0.79	0.32	1500	6	44.179	520.811	0.024	844.63	841.47	3.1	0.06	0.00143	2.414	249.5506	5.6487	0.248	249.55
07.01.01	AMOR & HENKE	24X36	30	24	CMP	42	866.29	866.09	0.004762	33.41	31.6	12.8	0.79	0.32	40	2	4.9087	33.41	0.024	869.29	868.09	0.59	0.61	0.01452	1.16	42.50348	8.6587	0.5826	33.41
08.03.09	CLEVELAND & WEHR	42	42	42	CMP	131	876.34	873.94	0.018321	86.6267	109.5	89.36	1.69	0.77	460	3.5	9.6211	86.6267	0.024	881.59	877.44	1.15	3	0.0229	1.452	130.9134	13.607	1.4388	86.627
08.03.10	CLEVELAND & WEHR	42	42	42	CMP	127	880.76	874.53	0.049055	86.6267	26.52	21.65	1.69	0.77	20	3.5	9.6211	86.6267	0.024	886.01	878.03	1.12	6.86	0.05402	1.452	201.057	20.897	3.3937	86.627
08.03.05	CLEVELAND & COUNTRY	30	30	30	CMP	89	873.97	873.16	0.009101	37.3535	33.8	15.4	1.69	0.77	20	2.5	4.9087	37.3535	0.024	877.72	875.66	0.6	1.46	0.0164	1.16	45.17161	9.2023	0.6581	37.354
08.03.03	CLEVELAND	42X66	54	42	ACMP	86	857.57	856.92	0.007558	143.199	135.2	61.6	1.69	0.77	80	3.5	15.904	143.199	0.024	862.82	860.42	1.15	1.25	0.01453	1.717	203.8528	12.817	1.2767	143.2
08.03.08	CLEVELAND & JOHNSON	42X66	54	42	ACMP	85	850.67	848.8	0.022000	143.199	135.2	61.6	1.69	0.77	80	3.5	15.904	143.199	0.024	855.92	852.3	0.5	1.32	0.03671	1.717	323.9506	20.369	3.2242	143.2
08.03.07	CLEVELAND & JOHNSON	24	24	24	CMP	65	852.05	850.97	0.016615	21.3824	135.2	61.6	1.69	0.77	80	2	3.1416	21.3824	0.024	855.05	852.97	0.5	1.58	0.02431	1	30.32699	9.6534	0.7242	21.382
08.03.06	CLEVELAND & JOHNSON	24	24	24	CMP	72	852.36	851.07	0.017917	21.3824	16.9	7.7	1.69	0.77	10	2	3.1416	21.3824	0.024	855.36	853.07	0.01	2.28	0.03167	1	34.61454	11.018	0.9434	21.382
09.04.03	CLEVELAND	24	24	24	CMP	50	864.34	863.94	0.008000	21.3824	21.7	10.1	2.17	1.01	10	2	3.1416	21.3824	0.024	867.34	865.94	0.52	0.88	0.0176	1	25.80559	8.2142	0.5243	21.382
09.04.02	CLEVELAND & POPLAR	54	54	54	CMP	143	846.54	845.89	0.004545	162.373	251	184	2.17	1.01	1500	4.5	15.904	162.373	0.024	853.29	850.39	1.05	1.85	0.01294	1.717	192.3219	12.092	1.1364	162.37
09.04.01	CLEVELAND & POPLAR	54	54	54	CMP	143	846.54	846.01	0.003706	162.373	251	184	2.17	1.01	1500	4.5	15.904	162.373	0.024	853.29	850.51	0.95	1.83	0.0128	1.717	191.2795	12.027	1.1241	162.37
09.04.04	GRAVEL ROAD	48X72	60	48	ACMP	25	859.45	859.25	0.008000	188.996	298.5	181.5	2.17	1.01	1000	4	19.635	188.996	0.024	865.45	863.25	0.52	1.68	0.0072	1.842	580.5178	29.566	6.793	189
09.03.01	CLEVELAND	30	30	30	CMP	130	891.69	890.51	0.009077	35.6729	58.2	26.4	2.91	1.32	20	2.5	4.9087	37.3535	0.024	895.44	893.01	1.1	1.33	0.01023	1.16	35.67289	7.2672	0.4104	35.673
09.03.02	CLEVELAND & TRIBUTARY	60	60	60	CMP	130	875.41	874.12	0.009923	211.303	126	72	2.91	1.32	460	5	19.635	211.303	0.024	882.91	879.12	0.58	3.21	0.02469	1.842	351.8939	17.922	2.496	211.3
09.02.01	LINCOLN & S.179th	26X36	30	26	ACMP	55	843.37	842.39	0.017818	34.7742	47.4	23.8	2.37	1.19	20	2.1667	4.9087	34.7742	0.024	846.62	844.56	0.75	1.313	0.02388	1.16	54.49922	11.102	0.9579	34.774
09.02.02	LINCOLN & S.179th	15X30	24	15	ACMP	50	849.1	847.49	0.032200	16.9043	23.7	11.9	2.37	1.19	10	1.25	3.1416	16.9043	0.024	850.975	848.74	0.89	1.345	0.0269	1	31.90315	10.155	0.8014	16.904
09.02.03	LIBERTY	21X28	24	21	ACMP	51	867.83	867.5	0.006471	20.0014	23.7	11.9	2.37	1.19	10	1.75	3.1416	20.0014	0.024	870.455	869.25	0.45	0.755	0.0148	1	23.66714	7.5335	0.441	20.001
10.01.10	CLEVELAND	30	30	30	CMP	84	873.98	870.84	0.037381	37.3535	37.1	18.8	3.71	1.88	10	2.5	4.9087	37.3535	0.024	877.73	873.34	1.12	3.27	0.03893	1.16	69.58544	14.776	1.5617	37.354
10.01.09	CLEVELAND & CALHOUN	24	24	24	CMP	10	882.11	881.66	0.045000	21.3824	37.1	18.8	3.71	1.88	10	2	3.1416	21.3824	0.024	885.11	883.66	1.24	0.21	1	28.18818	8.9126	0.6256	21.382	
10.01.08	CLEVELAND & CALHOUN	24	24	24	CMP	89	881.66	880.87	0.008876	21.3824	37.1	18.8	3.71	1.88	10	2	3.1416	21.3824	0.024	884.66	882.87	0.45	1.34	0.01506	1	23.86793	7.5974	0.4486	21.382
10.03.09	CALHOUN & W.RYERSON	24X36	30	24	ACMP	71	865.24	865.09	0.002113	33.41	37.1	18.8	3.71	1.88	10	2	4.9087	33.41	0.024	868.24	867.09	0.42	0.73	0.01028	1.16	35.76156	7.2853	0.4125	33.41
10.03.08	CALHOUN & W.RYERSON	24X36	30	24	ACMP	65	865.3	865.05	0.003846	33.41	37.1	18.8	3.71	1.88	10	2	4.9087	33.41	0.024	868.3	867.05	0.48	0.77	0.01185	1.16	38.386	7.8199	0.4752	33.41
10.03.07	W.RYERSON	40X58	48	40	ACMP	44	862.23	862.16	0.001591	110.418	104	52	3.71	1.88	50	3.3333	12.566	110.418	0.024	867.23	865.49	1.1	0.637	0.01447	1.587	148.571	11.823	1.0863	110.42
10.03.06	W.RYERSON	40X58	48	40	ACMP	44	862.22	861.71	0.011591	110.418	104	52	3.71	1.88	50	3.3333	12.566	110.418	0.024	867.22	865.04	1.54	0.637	0.01447	1.587	148.571	11.823	1.0863	110.42
10.03.11	DAKOTA & S.171st	24X36	30	24	ACMP	50	872.86	871.85	0.020200	33.41	37.1	18.8	3.71	1.88	10	2	4.9087	33.41	0.024	875.86	873.85	0.84	1.17	0.0234	1.16	53.95008	10.991	0.9387	33.41
10.02.08	S.170th & LINCOLN	24X36	30	24	ACMP	56	846.72	845.91	0.014464	33.41	62	34.6	3.1	1.73	20	2	4.9087	33.41	0.024	849.72	847.91	0.75	1.06	0.01893	1.16	48.52249	9.8849	0.7593	33.41
10.02.09	S.170th & LINCOLN	24X36	30	24	ACMP	52	846.64	845.71	0.017885	33.41	62	34.6	3.1	1.73	20	2	4.9087	33.41	0.024	849.64	847.71	0.85	1.08	0.02077	1.16	50.82699	10.354	0.8332	33.41
10.02.10	S.170th & LINCOLN	24	24	24	ACMP	54	846.51	845.71	0.014815	21.3824	62	34.6	3.1	1.73	20	2	3.1416	21.3824	0.024	849.51	847.71	0.64	1.16	0.02148	1	28.5095	9.0749	0.64	21.382
10.02.15	COMMERCE & LINCOLN	34x48	40	34	ACMP	52	842.05	842	0.00962	70.6949	155	86.5	3.1	1.73	50	2.8333	8.7266	70.6949	0.024	846.3	844.83	0.89	0.577	0.01109	1.406	79.98618	9.1657	0.6529	70.695
10.02.01	COMMERCE & LINCOLN	34x48	40	34	ACMP	48	842.07	841.92	0.003125	70.6949	155	86.5	3.1	1.73	50	2.8333	8.7266	70.6949	0.024	846.32	844.75	0.8	0.767	0.01597	1.406	95.9924	11	0.9403	70.695
10.02.11	GLENDAL & S.166th	30x42	36	30	ACMP	53	851.17	851.03	0.002642	53.7891	93	51.9	3.1	1.73	30	2.5	7.0686	53.7891	0.024	854.92	853.53	0.69	0.7	0.01321	1.31	65.90908	9.3242	0.6756	53.789
10.02.12	GLENDAL & S.166th	30x72	46	30	ACMP	51	851.2	851.03	0.003333	87.8223	93	51.9	3.1	1.73	30	2.5	11.541	87.8223	0.024	854.95	853.53	0.87	0.55	0.01078	1.543	114.5015	9.9213	0.6847	87.822
10.01.01	GLENDAL & S.162nd	70X124	102	70	CONC	57	841.88	841.8	0.001404	659.596	805	480	3.47	1.73	780	5.8333	56.745	659.596	0.013	850.63	847.63	2.25	0.497	0.00871	2.624	1588.636	27.996	6.0909	659.6
10.01.06	GLENDAL & S.162nd	70X144	102	70	CONC	48	841.87	841.8	0.001458	659.596	805	480	3.47	1.73	780	5.8333	56.745	659.596	0.013	850.62	847.63	2.25	0.737	0.01535	2.624	2108.357	37.155	10.728	659.6
10.01.07	S.162nd & DRAINAGE EASEMENT	36X48	42	36	ACMP	48	847.24	847.21	0.000625	80.2007	134	73	3.47	1.73	40	3	9.6211	80.2007	0.024	851.74	850.21	0.89	0.64	0.01333	1.452	99.89146	10.383	0.8377	80.201
10.01.04	S.162nd & OVERLAND	24X36	30	24	ACMP	61	847.63	847.17	0.007541	33.41	69.4	34.6	3.47	1.73															

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
10.04.04	RYERSON & JAMES	60X120	80	60	CONC	51	851.8	851.8	0.000000	375.651	579	336	2.5	1.25	460	5	34.907	375.651	0.013	859.3	856.8	2.1	0.4	0.00784	2.231	788.5219	22.589	3.9655	375.65
10.04.02	RYERSON & JAMES	60X120	80	60	CONC	51	851.8	851.79	0.000196	375.651	579	336	2.5	1.25	460	5	34.907	375.651	0.013	859.3	856.79	1.24	1.27	0.0249	2.231	1405.03	40.251	12.591	375.65
10.04.15	MOORLAND & RYERSON	96X108	102	96	CONC	125	852.35	852.16	0.001520	772.44	579	334	2.5	1.25	700	8	56.745	772.44	0.013	864.35	860.16	1	3.19	0.02552	2.624	2718.573	47.912	17.839	772.44
10.04.16	MOORLAND & RYERSON	96X108	102	96	CONC	125	852.35	852.16	0.001520	772.44	579	334	2.5	1.25	700	8	56.745	772.44	0.013	864.35	860.16	2	2.19	0.01752	2.624	2252.664	39.698	12.247	772.44
11.02.01	CLEVELAND & PARKWAY	30	30	30	CMP	96	870.76	870.36	0.004167	37.3535	138.8	69.2	3.47	1.73	40	2.5	4.9087	37.3535	0.024	874.51	872.86	0.49	1.16	0.01208	1.16	38.76837	7.8978	0.4847	37.354
11.02.04	PARKWAY	36	36	36	RCP	68	864.4	864.1	0.004412	58.923	173.5	86.5	3.47	1.73	50	3	7.0686	58.923	0.013	868.9	867.1	1.25	0.55	0.00809	1.31	95.22017	13.471	1.4102	58.923
11.02.05	PARKWAY & PARKSIDE	36X50	42	36	ACMP	75	864.1	863.49	0.008133	80.2007	138.8	69.2	3.47	1.73	40	3	9.6211	80.2007	0.024	868.6	866.49	1.15	0.96	0.0128	1.452	97.87324	10.173	0.8042	80.201
11.02.06	PARKWAY & PARKSIDE	36X50	42	36	ACMP	75	863.75	863.67	0.001067	80.2007	138.8	69.2	3.47	1.73	40	3	9.6211	80.2007	0.024	868.25	866.67	0.75	0.83	0.01107	1.452	91.00545	9.4589	0.6953	80.201
11.02.08	KRAHN & BROOKSIDE	32X48	42	32	ACMP	48	861.91	861.62	0.006042	75.614	242.9	121.1	3.47	1.73	70	2.6667	9.6211	75.614	0.024	865.91	864.29	0.98	0.643	0.0134	1.452	100.1513	10.41	0.8421	75.614
11.02.09	KRAHN & BROOKSIDE	32X48	42	32	ACMP	48	861.7	861.57	0.002708	75.614	242.9	121.1	3.47	1.73	70	2.6667	9.6211	75.614	0.024	865.7	864.24	0.78	0.683	0.01424	1.452	103.2178	10.728	0.8944	75.614
11.02.13	BROOKSIDE & GRAYLOG	32X48	42	32	ACMP	60	859.61	859.42	0.003167	75.614	242.9	121.1	3.47	1.73	70	2.6667	9.6211	75.614	0.024	863.61	862.09	0.97	0.553	0.00922	1.452	83.07623	8.6348	0.5794	75.614
11.02.20	BROOKSIDE & GRAYLOG	32X48	42	32	ACMP	60	859.61	859.42	0.003167	75.614	242.9	121.1	3.47	1.73	70	2.6667	9.6211	75.614	0.024	863.61	862.09	0.78	0.743	0.01239	1.452	96.28866	10.008	0.7784	75.614
11.02.16	LINCOLN & BROOKSIDE	24	24	24	CMP	60	863.49	863	0.008167	21.3824	104.1	51.9	3.47	1.73	30	2	3.1416	21.3824	0.024	866.49	865	0.5	0.99	0.0165	1	24.98615	7.9533	0.9912	21.382
11.01.14	CLEVELAND	30	30	30	CMP	76	874.32	872.98	0.017632	37.3535	29	11.6	1.45	0.58	20	2.5	4.9087	37.3535	0.024	878.07	875.48	0.75	1.84	0.02421	1.16	54.87649	11.179	0.9712	37.354
11.01.01	CLEVELAND & BROOKLAND	24	24	24	CMP	50	874.9	874.35	0.011000	21.3824	43.5	17.4	1.45	0.58	30	2	3.1416	21.3824	0.024	877.9	876.35	0.58	0.97	0.0194	1	27.09308	8.624	0.578	21.382
11.04.18	CLEVELAND & MEADOWMERE	24	24	24	CMP	46	866.67	866.12	0.011957	21.3824	43.5	17.4	1.45	0.58	30	2	3.1416	21.3824	0.024	869.67	868.12	0.59	0.96	0.02087	1	28.10051	8.9447	0.6218	21.382
11.04.07	OVERLAND & MEADOWMERE	24X36	30	24	ACMP	42	848.8	848.39	0.009762	33.41	29	11.6	1.45	0.58	20	2	4.9087	33.41	0.024	851.8	850.39	0.64	0.77	0.01833	1.16	47.75347	9.7283	0.7355	33.41
11.01.04	OVERLAND & LILAC	24	24	24	CMP	41	838.51	838.14	0.009024	21.3824	29	11.6	1.45	0.58	20	2	3.1416	21.3824	0.024	841.51	840.14	0.58	0.79	0.01927	1	27.00095	8.5947	0.574	21.382
11.01.03	OVERLAND & LILAC	24	24	24	CMP	41	838.37	838.01	0.008780	21.3824	29	11.6	1.45	0.58	20	2	3.1416	21.3824	0.024	841.37	840.01	0.58	0.78	0.01902	1	26.82951	8.5401	0.5668	21.382
11.04.16	LILAC & LOMBARDY	24	24	24	CMP	54	835.52	835.12	0.007407	21.3824	43.5	17.4	1.45	0.58	30	2	3.1416	21.3824	0.024	838.52	837.12	0.5	0.9	0.01667	1	25.11203	7.9934	0.4965	21.382
11.04.15	LILAC & SUNNY SLOPE	24	24	24	CMP	37	832.88	832.19	0.018649	21.3824	43.5	17.4	1.45	0.58	30	2	3.1416	21.3824	0.024	835.88	834.19	0.75	0.94	0.02541	1	31.0042	9.8689	0.7569	21.382
11.04.19	LILAC & SUNNY SLOPE	27X42	34	27	ACMP	44	831.52	831.42	0.002273	45.5164	87	34.8	1.45	0.58	60	2.25	6.305	45.5164	0.024	834.895	833.67	0.64	0.585	0.0133	1.261	56.77924	9.0054	0.6302	45.516
11.04.20	CLEVELAND & SUNNYSLOPE	18X30	24	18	ACMP	62	839.23	838.4	0.013387	18.5177	58	23.2	1.45	0.58	40	1.5	3.1416	18.5177	0.024	841.48	839.9	0.51	1.07	0.01726	1	25.55368	8.134	0.5142	18.518
11.04.21	CLEVELAND & SUNNYSLOPE	18X24	21	18	ACMP	111	837.49	837.09	0.003604	11.5663	14.5	5.8	1.45	0.58	10	1.5	2.4053	14.1776	0.024	839.74	838.59	0.35	0.8	0.00721	0.915	11.56633	4.8087	0.1797	11.566
11.04.01	CLEVELAND & FRANKLIN	24	24	24	CMP	47	876.17	875.98	0.004043	21.3824	15.4	7.4	1.54	0.74	10	2	3.1416	21.3824	0.024	879.17	877.98	0.48	0.71	0.01511	1	23.90769	7.6101	0.4501	21.382
11.04.05	FRANKLIN & CONNIE	36	36	36	CMP	42	846.1	845.28	0.019524	58.923	107.8	51.8	1.54	0.74	70	3	7.0686	58.923	0.024	850.6	848.28	1.12	1.2	0.02857	1.31	96.93936	13.714	1.4616	58.923
11.04.22	SUNNYSLOPE & SOUTH OF CLEVELAND	60	60	60	CMP	39	820.54	820.17	0.009487	211.303	215.6	103.6	1.54	0.74	140	5	19.635	211.303	0.024	828.04	825.17	2.1	0.77	0.01974	1.842	314.6618	16.026	1.9958	211.3
11.04.10	CONNIE & MAYLORE	21X42	36	21	ACMP	44	857.3	857.01	0.006591	45.0032	61.6	29.6	1.54	0.74	40	1.75	7.0686	45.0032	0.024	859.925	858.76	0.66	0.505	0.01148	1.31	61.44033	8.692	0.5871	45.003
11.03.02	CLEVELAND & 152nd	24	24	24	CMP	35	886.36	885.4	0.027429	21.3824	45.8	24.2	4.58	2.42	10	2	3.1416	21.3824	0.024	889.36	887.4	0.75	1.21	0.03457	1	36.1673	11.512	1.03	21.382
11.03.06	CLEVELAND & 149th	24	24	24	CMP	53	874.83	874.42	0.007736	21.3824	45.8	24.2	4.58	2.42	10	2	3.1416	21.3824	0.024	877.83	876.42	0.5	0.91	0.01717	1	25.48826	8.1132	0.5115	21.382
12.01.07	LAGOON & CLEVELAND	66X96	78	66	ACMP	82	748.17	746.74	0.017439	374.533	349	179	1.07	0.35	550	5.5	33.183	374.533	0.024	756.42	752.24	2.4	1.76	0.02171	2.194	664.1757	20.015	3.1133	374.53
12.01.06	CLEVELAND	66X96	78	66	ACMP	82	747.83	746.92	0.011098	374.533	349	179	1.07	0.35	550	5.5	33.183	374.533	0.024	756.08	752.42	2.1	1.58	0.01902	2.194	621.7779	18.738	2.7285	374.53
12.01.08	CLEVELAND	96X153	120	96	ACMP	90	754.75	754.38	0.004111	1069.12	631	334	1.07	0.35	1030	8	78.54	1069.12	0.024	766.75	762.38	3.1	1.27	0.01411	2.924	1689.111	21.506	3.5944	1069.1
12.01.21	CLEVELAND	30	30	30	CMP	62	768.33	766.29	0.032903	37.3535	32.1	10.5	1.07	0.35	30	2.5	4.9087	37.3535	0.024	772.08	768.79	1.2	0.09	0.03371	1.16	64.75324	13.191	1.3523	37.354
12.01.22	CLEVELAND	30	30	30	CMP	64	765.69	764.14	0.024219	37.3535	32.1	10.5	1.07	0.35	30	2.5	4.9087	37.3535	0.024	769.44	766.64	0.86	1.94	0.03031	1.16	61.40377	12.509	1.216	37.354
12.01.04	124th	58	58	58	RCP	50	748.1	746.02	0.041600	194.133	642	210	1.07	0.35	600	4.8333	18.348	194.133	0.013	755.35	750.85	3.2	1.297	0.02593	1.801	608.2274	33.16	8.5399	194.13
12.01.05	124th	58	58	58	RCP	50	748.1	746.02	0.041600	194.133	642	210	1.07	0.35	600	4.8333	18.348	194.133	0.013	755.35	750.85	3.5	0.997	0.01993	1.801	533.245	29.063	6.5641	194.13
12.02.02	LILAC	32X48	42	32	ACMP	493	831.52	823.75	0.015761	75.614	207.6	70.8	1.73	0.59	120	2.6667	9.6211	75.614	0.024	835.52	826.42	0.75	8.353	0.01694	1.452	112.607	11.704	1.0646	75.614
12.02.16	LINCOLN & 134th	18X30	24	18	ACMP	46	830.6	829.64	0.020870	18.5177	34.6	11.8	1.73	0.59	20	1.5	3.1416	18.5177	0.024	832.85	831.14	0.64	1.07	0.02326	1	29.66678	9.4432	0.693	18.518
12.02.18	LINCOLN & 133rd	18X30	24	18	ACMP	45	822.6	821.79	0.018000	18.5177	34.6	11.8	1.73	0.59	20	1.5	3.1416	18.5177	0.024	824.									

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
12.03.06	FOUNTAIN SQUARE	42	42	42	RCP	74	808.57	807.62	0.012838	86.6267	540	160	2.7	0.8	200	3.5	9.6211	86.6267	0.013	813.82	811.12	1.24	1.46	0.01973	1.452	224.33	23.316	4.2249	86.627
12.03.07	FOUNTAIN SQUARE	42	42	42	RCP	74	808.35	807.67	0.009189	86.6267	540	160	2.7	0.8	200	3.5	9.6211	86.6267	0.013	813.6	811.17	1.5	0.93	0.01257	1.452	179.041	18.609	2.6912	86.627
13.01.17	NATIONAL & HIGHPOINT	24	24	24	RCP	46.5	790.44	789.39	0.022581	21.3824	19.5	7.9	1.95	0.79	10	2	3.1416	21.3824	0.013	793.44	791.39	0.52	1.53	0.0329	1	65.13952	20.735	3.341	21.382
13.01.18	NATIONAL & HIGHPOINT	30	30	30	RCP	25	788.96	785.5	0.138400	37.3535	39	15.8	1.95	0.79	20	2.5	4.9087	37.3535	0.013	792.71	788	2.5	2.21	0.0884	1.16	193.5879	39.437	12.087	37.354
13.01.13	OHIO & RUSSEL	30X42	36	30	ACMP	40	785.04	784.47	0.014250	53.7891	97.5	39.5	1.95	0.79	50	2.5	7.0686	53.7891	0.024	788.79	786.97	1.1	0.72	0.018	1.31	76.94324	10.885	0.9208	53.789
13.01.15	OHIO & RUSSEL	30	30	30	CMP	46	784.76	784.28	0.010435	37.3535	78	31.6	1.95	0.79	40	2.5	4.9087	37.3535	0.024	788.51	786.78	0.31	1.42	0.03087	1.16	61.96542	12.623	1.2384	37.354
13.01.06	HICKORY & OHIO	30X42	36	30	ACMP	42	780.49	780	0.011667	53.7891	97.5	39.5	1.95	0.79	50	2.5	7.0686	53.7891	0.024	784.24	782.5	0.95	0.79	0.01881	1.31	78.65441	11.127	0.9622	53.789
13.01.14	HICKORY & OHIO	30	30	30	ACMP	47	781.27	781.13	0.002979	37.3535	58.5	23.7	1.95	0.79	30	2.5	4.9087	37.3535	0.024	785.02	783.63	0.64	0.75	0.01596	1.16	44.55186	9.076	0.6401	37.354
13.04.01	S. 124th & OHIO	37X52	44	37	CMP	50	777.45	776.38	0.021400	89.2349	39	15.8	1.95	0.79	20	3.0833	10.559	89.2349	0.024	782.075	779.46	1.2	1.412	0.02823	1.498	164.5568	15.584	1.8874	89.235
13.01.11	RUSSEL & HICKORY	24X36	30	24	ACMP	43	788.74	788.33	0.009535	33.41	78	31.6	1.95	0.79	40	2	4.9087	33.41	0.024	791.74	790.33	0.69	0.72	0.01674	1.16	45.63691	9.2971	0.6717	33.41
13.01.12	RUSSEL & HICKORY	30X42	36	30	ACMP	30	787.36	786.07	0.043000	53.7891	78	31.6	1.95	0.79	40	2.5	7.0686	53.7891	0.024	791.11	788.57	1.25	1.29	0.043	1.31	118.9237	16.824	2.1997	53.789
13.01.02	VERONA & RUSSEL	24X36	30	24	ACMP	43	796.18	795.09	0.025349	33.41	39	15.8	1.95	0.79	20	2	4.9087	33.41	0.024	799.18	797.09	0.85	1.24	0.02884	1.16	59.89089	12.201	1.1568	33.41
13.01.10	HICKORY DRAINAGE EASEMENT	36	36	36	CMP	36	781.93	774.92	0.194722	58.923	97.5	39.5	1.95	0.79	50	3	7.0686	58.923	0.024	786.43	777.92	3.5	5.01	0.13917	1.31	213.9448	30.267	7.1191	58.923
13.04.19	S.124th	32X48	42	32	ACMP	42	772.66	771.15	0.039552	75.614	117	47.4	1.95	0.79	60	2.6667	9.6211	75.614	0.024	776.66	773.82	2.1	0.743	0.0177	1.452	115.087	11.962	1.112	75.614
13.03.18	SUNNY SLOPE	21X27	24	21	ACMP	81	876.4	876.09	0.003827	20.0014	15	6	1.5	0.6	10	1.75	3.1416	20.0014	0.024	879.025	877.84	0.31	0.875	0.0108	1	20.2171	6.4353	0.3218	20.001
13.03.14	CRAWFORD & MEADOWOOD	24X36	30	24	ACMP	43	864.52	863.48	0.024186	33.41	15	6	1.5	0.6	10	2	4.9087	33.41	0.024	867.52	865.48	0.98	1.06	0.02465	1.16	55.37362	11.281	0.9889	33.41
13.03.15	WILLOW & CRAWFORD	21X27	24	21	ACMP	61	852.24	852.01	0.003770	20.0014	30	12	1.5	0.6	20	1.75	3.1416	20.0014	0.024	854.865	853.76	0.4	0.705	0.01156	1	20.91159	6.6564	0.3443	20.001
13.03.21	CORETTA & WILLOW	24X36	30	24	ACMP	59	853.91	853.65	0.004407	33.41	15	6	1.5	0.6	10	2	4.9087	33.41	0.024	856.91	855.65	0.51	0.75	0.01271	1.16	39.76388	8.1006	0.5099	33.41
13.03.24	THOMAS WILBUR & CORETTA	18X27	22	18	ACMP	44	864.29	862.64	0.037500	15.56	15	6	1.5	0.6	10	1.5	2.6398	15.56	0.024	866.54	864.14	0.91	1.49	0.03386	0.944	28.38277	10.752	0.8984	15.56
13.03.04	THOMAS WILBUR	24X36	30	24	ACMP	45	866.6	865.86	0.016444	33.41	15	6	1.5	0.6	10	2	4.9087	33.41	0.024	869.6	867.86	0.89	0.85	0.01889	1.16	48.4716	9.8746	0.7577	33.41
13.03.03	WILLOW GLEN & THOMAS WILBURN	24	24	24	CMP	130	870.74	869.32	0.010923	21.3824	15	6	1.5	0.6	10	2	3.1416	21.3824	0.024	873.74	871.32	0.48	1.94	0.01492	1	23.7622	7.5637	0.4446	21.382
13.03.07	WILLOW GLEN & THOMAS WILBURN	24X36	30	24	ACMP	44	849.53	849.08	0.010227	33.41	30	12	1.5	0.6	20	2	4.9087	33.41	0.024	852.53	851.08	0.65	0.8	0.01818	1.16	47.55573	9.688	0.7294	33.41
13.03.08	THOMAS WILBUR & OAKDALE	31X42	36	31	ACMP	44	844.23	843.76	0.010682	54.6782	45	18	1.5	0.6	30	2.5833	7.0686	54.6782	0.024	848.105	846.34	0.8	0.962	0.02186	1.31	84.78522	11.995	1.1181	54.678
13.03.13	OAKDALE & CRAWFORD	24X36	30	24	ACMP	42	849.87	849.59	0.006667	33.41	45	18	1.5	0.6	30	2	4.9087	33.41	0.024	852.87	851.59	0.63	0.65	0.01548	1.16	43.87491	8.9381	0.6208	33.41
13.03.12	GREENLAWN TERRACE & CRAWFORD	31X42	36	31	ACMP	42	847.23	847.1	0.003095	54.6782	75	30	1.5	0.6	50	2.5833	7.0686	54.6782	0.024	851.105	849.68	0.75	0.672	0.01599	1.31	72.52478	10.26	0.8181	54.678
13.03.09	GREENLAWN TERRACE & THOMAS WILBURN	31X42	36	31	ACMP	48	837.65	837.64	0.000208	54.6782	45	18	1.5	0.6	30	2.5833	7.0686	54.6782	0.024	841.525	840.22	0.75	0.552	0.01149	1.31	61.48256	8.698	0.5879	54.678
13.03.21	MAPLEWOOD & SUNNYVIEW	18X27	22	18	ACMP	40	854.66	853.73	0.023250	15.56	30	12	1.5	0.6	20	1.5	2.6398	15.56	0.024	856.91	855.23	0.68	1	0.025	0.944	24.38698	9.2382	0.6632	15.56
13.03.02	HOWARD & SUNNYVIEW	24	24	24	CMP	24	867.87	866.92	0.039583	21.3824	30	12	1.5	0.6	20	2	3.1416	21.3824	0.024	870.87	868.92	0.9	1.05	0.04375	1	40.68614	12.951	1.3034	21.382
13.03.10	SANDALWOOD & CRAWFORD	24X36	30	24	ACMP	45	846.47	845.83	0.014222	33.41	34.6	11.8	1.73	0.59	20	2	4.9087	33.41	0.024	849.47	847.83	0.75	0.89	0.01978	1.16	49.599	10.104	0.7934	33.41
13.03.11	SANDALWOOD & CRAWFORD	21X27	24	21	ACMP	45	845.65	845.32	0.007333	20.0014	34.6	11.8	1.73	0.59	20	1.75	3.1416	20.0014	0.024	848.275	847.07	0.48	0.725	0.01611	1	24.68995	7.8591	0.48	20.001
13.03.20	SANDALWOOD & CRAWFORD	21X27	24	21	ACMP	44	845.59	845.36	0.005227	20.0014	34.6	11.8	1.73	0.59	20	1.75	3.1416	20.0014	0.024	848.215	847.11	0.5	0.605	0.01375	1	22.80913	7.2604	0.4096	20.001
13.03.13	SANDALWOOD & CRAWFORD	36	36	36	CMP	26	845.72	844.64	0.041538	58.923	69.2	23.6	1.73	0.59	40	3	7.0686	58.923	0.024	850.22	847.64	1.24	1.34	0.05154	1.31	130.1967	18.419	2.6365	58.923
13.03.19	CRAWFORD & WILBUR	24	24	24	CMP	71	818.9	818.21	0.009718	21.3824	173	59	1.73	0.59	100	2	3.1416	21.3824	0.024	821.9	820.21	0.5	1.19	0.01676	1	25.18267	8.0159	0.4993	21.382
13.02.06	S.124th	72X90	80	72	CONC	33	793.67	792.98	0.020909	41.505	437	224	1.73	0.59	430	6	34.907	41.505	0.013	802.67	798.98	2.95	0.74	0.02242	2.231	1333.299	38.196	11.338	41.505
13.02.07	S.124th	48	48	48	CMP	25	793.67	792.98	0.027600	120.957	131	68	1.73	0.59	215	4	12.566	120.957	0.024	799.67	796.98	2.12	0.57	0.0228	1.587	186.4969	14.841	1.7116	120.96
13.02.08	S.124th	48	48	48	CMP	25	793.76	793.67	0.003600	120.957	131	68	1.73	0.59	215	4	12.566	120.957	0.024	799.76	797.67	1.12	0.97	0.0388	1.587	243.2876	29.36	2.9128	120.96
13.01.19	2514000E, 365250N	24	24	24	RCP	142	815.75	810.57	0.036479	21.3824	96.4	37.2	2.41	0.93	40	2	3.1416	21.3824	0.013	818.75	812.57	0.75	0.543	0.03824	1	70.22327	22.353	3.8829	21.382
13.01.20	2513500E, 365000N	24	24	24	RCP	120	819.7	817.92	0.014833	21.3824	96.4	37.2	2.41	0.93	40	2	3.1416	21.3824	0.013	822.7	819.92	0.53	2.25	0.01875	1	49.17292	15.652	1.9039	21.382
14.01.01	HOWARD	24	24	24	RCP	38	876.9	875.86	0.027368	21.3824	35.8	17.6	1.79	0.88	20	2	3.1416	21.3824	0.013	879.9	877.86	1.02	1.02	0.02684	1	58.83471	18.728	2.7256	21.382
14.01.02	HOWARD	18X27	22	18	RCP	72	875.86	875.32	0.007500	15.56	17.9	8.8	1.79	0.88	10	1.5	2.6398	15.56	0.013	878.11	876.82	0.45	0.84	0.01167	0.944	30.75595	11.651	1.0	

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
15.04.07	ST. FRANCIS	24	24	24	CMP	37	903.66	902.66	0.027027	21.3824	63	31.5	2.1	1.05	30	2	3.1416	21.3824	0.024	906.66	904.66	0.8	1.2	0.03243	1	35.03057	11.151	0.9662	21.382
15.03.01	CALHOUN	30	30	30	CMP	57	869.22	868.97	0.004386	37.3535	504	252	2.1	1.05	240	2.5	4.9087	37.3535	0.024	872.97	871.47	0.6	0.9	0.01579	1.16	44.31676	9.0281	0.6334	37.354
15.01.01	COFFEE	30x40	34	30	CMP	44	867	866.86	0.003182	47.9785	42	21	2.1	1.05	20	2.5	6.305	47.9785	0.024	870.75	869.36	0.8	0.59	0.01341	1.261	57.02137	9.0438	0.6356	47.979
15.01.02	COFFEE	24	24	24	CMP	43	866.35	865.92	0.010000	21.3824	42	21	2.1	1.05	20	2	3.1416	21.3824	0.024	869.35	867.92	0.58	0.85	0.01977	1	27.34845	8.7053	0.5889	21.382
15.02.12	CALHOUN	80	80	80	CONC	63	858.69	858.46	0.003651	433.764	1680	840	2.1	1.05	800	6.6667	34.907	433.764	0.013	868.69	865.13	1.8	1.763	0.02799	2.231	1489.587	42.674	14.152	433.76
15.02.11	CALHOUN	80	80	80	CONC	63	858.75	858.48	0.004286	433.764	1680	840	2.1	1.05	800	6.6667	34.907	433.764	0.013	868.75	865.15	1.9	1.703	0.02704	2.231	1464.025	41.941	13.67	433.76
15.02.13	CALHOUN	80	80	80	CONC	63	858.92	858.53	0.006190	433.764	1680	840	2.1	1.05	800	6.6667	34.907	433.764	0.013	868.92	865.2	1.6	2.123	0.0337	2.231	1634.585	46.827	17.041	433.76
15.02.09	VICTOR & CALHOUN	60	60	60	CMP	60	856.42	856.02	0.006667	211.303	1890	945	2.1	1.05	900	5	19.635	211.303	0.024	863.92	861.02	1.5	1.4	0.02333	1.842	342.0734	17.422	2.3587	211.3
15.02.08	VICTOR & CALHOUN	60	60	60	CMP	60	856.28	855.88	0.006667	211.303	1890	945	2.1	1.05	900	5	19.635	211.303	0.024	863.78	860.88	2.1	0.8	0.01333	1.842	258.5832	13.17	1.3478	211.3
15.02.10	VICTOR & CALHOUN	60	60	60	CMP	60	856.46	856.06	0.006667	211.303	1890	945	2.1	1.05	900	5	19.635	211.303	0.024	863.96	861.06	1.8	1.1	0.01833	1.842	303.2157	15.443	1.8532	211.3
15.02.19	VICTOR & CALHOUN	24	24	24	CMP	59	861.42	861.27	0.002542	21.3824	42	21	2.1	1.05	20	2	3.1416	21.3824	0.024	864.42	863.27	0.4	0.75	0.01271	1	21.93118	6.9809	0.3787	21.382
15.02.18	VICTOR	36x58	48	36	ACMP	49	859.67	859.05	0.012653	104.752	105	52.5	2.1	1.05	50	3	12.566	104.752	0.024	864.17	862.05	1.5	0.62	0.01265	1.587	138.9319	11.056	0.9499	104.75
15.02.07	VICTOR	36x58	48	36	ACMP	49	859.53	859.01	0.010612	104.752	105	52.5	2.1	1.05	50	3	12.566	104.752	0.024	864.03	862.01	1.12	0.9	0.01837	1.587	167.3892	13.32	1.3789	104.75
15.02.06	VICTOR	36x58	48	36	ACMP	49	859.67	859.33	0.006939	104.752	105	52.5	2.1	1.05	50	3	12.566	104.752	0.024	864.17	862.33	1.24	0.6	0.01224	1.587	136.6727	10.879	0.9192	104.75
15.02.05	VICTOR & S.166th	21X30	24	21	ACMP	48	866.82	866.48	0.007083	20.0014	42	21	2.1	1.05	20	1.75	3.1416	20.0014	0.024	869.445	868.23	0.46	0.755	0.01573	1	24.39553	7.7653	0.4686	20.001
15.02.04	VICTOR & S.166th	21X30	24	21	ACMP	48	866.73	866.52	0.004375	20.0014	63	31.5	2.1	1.05	20	1.75	3.1416	20.0014	0.024	869.355	868.27	0.4	0.685	0.01427	1	23.23711	7.3966	0.4252	20.001
15.02.03	S.166th & DRAINAGE EASEMENT	45X66	54	45	CONC	53	862.2	862.01	0.003585	148.225	63	31.5	2.1	1.05	30	3.75	15.904	148.225	0.013	867.825	865.76	1.5	0.565	0.01066	1.717	322.3036	20.265	3.1915	148.23
15.02.02	S.166th & DRAINAGE EASEMENT	45X66	54	45	CONC	53	861.47	861.2	0.005094	148.225	63	31.5	2.1	1.05	30	3.75	15.904	148.225	0.013	867.095	864.95	1.5	0.645	0.01217	1.717	344.3664	21.652	3.6433	148.23
15.02.01	S.166th & DRAINAGE EASEMENT	45X66	54	45	CONC	53	862.27	862.05	0.004151	148.225	63	31.5	2.1	1.05	30	3.75	15.904	148.225	0.013	867.895	865.8	1.24	0.855	0.01613	1.717	396.4824	24.929	4.8296	148.23
15.01.03	RIVIERA & MONTERREY	18X30	24	18	ACMP	40	874.83	874.44	0.009750	18.5177	42	21	2.1	1.05	20	1.5	3.1416	18.5177	0.024	877.08	875.94	0.49	0.65	0.01625	1	24.79614	7.8929	0.4841	18.518
15.01.06	SANTA ROSA BLVD	32X48	42	32	ACMP	38	880.59	880.5	0.002368	75.614	168	84	2.1	1.05	80	2.6667	9.6211	75.614	0.024	884.59	883.17	0.75	0.673	0.01772	1.452	115.1549	11.969	1.1133	75.614
15.01.07	SANTA ROSA BLVD	24	24	24	CMP	24	893.14	892.6	0.002500	21.3824	42	21	2.1	1.05	20	2	3.1416	21.3824	0.024	896.14	894.6	0.89	0.65	0.02708	1	32.01168	10.19	0.8069	21.382
15.01.10	SANTA ROSA BLVD	24	24	24	CMP	46	894.6	893.86	0.016087	21.3824	42	21	2.1	1.05	20	2	3.1416	21.3824	0.024	897.6	895.86	0.65	1.09	0.0237	1	29.94276	9.5311	0.7059	21.382
15.02.14	COFFEE, 20' DRAINAGE EASEMENT	24	24	24	CMP	38	898.89	898.8	0.002368	21.3824	42	21	2.1	1.05	20	2	3.1416	21.3824	0.024	901.89	900.8	0.4	0.69	0.01816	1	26.2114	8.3433	0.541	21.382
15.02.15	COFFEE, 20' DRAINAGE EASEMENT	21X27	24	21	CMP	8	899.21	898.8	0.051250	20.0014	42	21	2.1	1.05	20	1.75	3.1416	20.0014	0.024	901.835	900.55	1.2	0.085	0.01063	1	20.05035	6.3822	0.3165	20.001
15.01.11	SANTA ROSA BLVD	36	36	36	CMP	43	900.48	898.86	0.037674	58.923	63	31.5	2.1	1.05	30	3	7.0686	58.923	0.024	904.98	901.86	0.75	2.37	0.05512	1.31	134.64	19.048	2.8195	58.923
15.01.13	20' DRAINAGE EASEMENT	36	36	36	CMP	264	904.26	900.48	0.014318	58.923	63	31.5	2.1	1.05	30	3	7.0686	58.923	0.024	908.76	903.48	0.81	4.47	0.01693	1.31	74.62528	10.557	0.8662	58.923
15.04.02	COFFEE	36	36	36	CMP	43	904.63	904.26	0.008605	58.923	63	31.5	2.1	1.05	30	3	7.0686	58.923	0.024	909.13	907.26	1.2	0.67	0.01558	1.31	71.58753	10.128	0.7971	58.923
16.02.04	WILLOW	24X36	30	24	ACMP	44	892.78	892.28	0.011364	33.41	53	40	2.91	1.32	400	2	4.9087	33.41	0.024	895.78	894.28	0.5	1	0.02273	1.16	53.16892	10.831	0.9117	33.41
16.02.05	THORNAPPLE	20X28	24	20	ACMP	45	895.78	895.76	0.000444	17.2363	58.2	26.4	2.91	1.32	20	1.6667	3.1416	19.5194	0.024	898.28	897.43	0.5	0.353	0.00785	1	17.23628	5.4865	0.2339	17.236
16.03.01	COFFEE & WOELFEL	18X24	21	18	ACMP	47	872.42	872.25	0.003617	14.1776	68.4	30.6	1.14	0.51	60	1.5	2.4053	14.1776	0.024	874.67	873.75	0.25	0.67	0.01426	0.915	16.26675	6.7629	0.3554	14.178
16.01.11	CALHOUN S. OF COFFEE	30	30	30	CMP	57	869.22	868.97	0.004386	37.3535	504	252	2.1	1.05	240	2.5	4.9087	37.3535	0.024	872.97	871.47	0.6	0.9	0.01579	1.16	44.31676	9.0281	0.6334	37.354
16.01.11	COFFEE W. OF CALHOUN	80	80	80	CONC	63	858.92	858.53	0.006190	433.764	397	136	0.95	0.41	800	6.6667	34.907	433.764	0.013	868.92	865.2	1.23	1.493	0.0237	2.231	1370.809	39.271	11.958	433.76
16.01.12	CALHOUN	80	80	80	CONC	63	858.69	858.46	0.003651	433.764	397	136	0.95	0.41	800	6.6667	34.907	433.764	0.013	868.69	865.13	3.12	0.443	0.00704	2.231	746.9022	21.397	3.558	433.76
16.01.13	CALHOUN	80	80	80	CONC	63	858.72	858.48	0.003810	433.764	397	136	0.95	0.41	800	6.6667	34.907	433.764	0.013	868.72	865.15	3.21	0.363	0.00577	2.231	676.1626	19.371	2.9159	433.76
16.01.09	CALHOUN	60	60	60	CMP	66	856.42	856.02	0.006061	211.303	199	121	0.95	0.41	900	5	19.635	211.303	0.024	863.92	861.02	1.45	1.45	0.02197	1.842	331.9273	16.905	2.2208	211.3
16.01.10	CALHOUN	60	60	60	CMP	66	856.28	855.88	0.006061	211.303	199	121	0.95	0.41	900	5	19.635	211.303	0.024	863.78	860.88	1.76	1.14	0.01727	1.842	294.3143	14.989	1.746	211.3
16.01.08	CALHOUN	60	60	60	CMP	66	856.46	856.06	0.006061	211.303	185.3	64.33	0.95	0.41	900	5	19.635	211.303	0.024	863.96	861.06	1.12	1.78	0.02697	1.842	367.7638	18.73	2.7263	211.3
16.01.04	CALHOUN	24	24	24	CMP	59	861.42	861.27	0.002542	21.3824	19	8.2	0.95	0.41	20	2	3.1416	21.3824	0.024	864.42	863.27	0.41	0.74	0.01254	1	21.78448	6.9342	0.3737	21.382
16.01.01	COFFEE & 35' DRAINAGE EASEMENT	66	66	66	CMP	40	862.44	862.16	0.007000	268.157	502	368	0.95	0.41	700	5.5	23.758	268.157	0.024	870.69	867.66	2.13	0.9	0.0225	1.963	433.1145	18.23	2.5826	268.16
16.01.03	CO																												

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
18.03.09	WOODLAND & RACINE	24	24	24	CMP	47	938.61	937.98	0.013404	21.3824	43.4	20.2	2.17	1.01	20	2	3.1416	21.3824	0.024	941.61	939.98	0.65	0.98	0.02085	1	28.08805	8.9407	0.6212	21.382
18.03.07	WOODLAND & RACINE	48	48	48	CMP	63	941.8	940.96	0.013333	120.957	173.6	80.8	2.17	1.01	80	4	12.566	120.957	0.024	947.8	944.96	1.45	1.39	0.02206	1.587	183.46	14.599	1.6563	120.96
18.03.05	RACINE & ORCHARD	24	24	24	CMP	44	946.19	945.98	0.004773	21.3824	65.1	30.3	2.17	1.01	30	2	3.1416	21.3824	0.024	949.19	947.98	0.49	0.72	0.01636	1	24.88269	7.9204	0.4875	21.382
18.04.01	RACINE & SWARTZ	24	24	24	CMP	62	974.91	974.66	0.004032	21.3824	29.6	12.6	1.48	0.63	20	2	3.1416	21.3824	0.024	977.91	976.66	0.42	0.83	0.01339	1	22.50612	7.1639	0.3988	21.382
19.03.14	BEEHEIM & S.VALLEY	24X36	30	24	ACMP	44	993.04	992.9	0.003182	33.41	69.3	29.7	0.77	0.33	90	2	4.9087	33.41	0.024	996.04	994.9	0.5	0.64	0.01455	1.16	42.53514	8.6652	0.5835	33.41
19.03.15	BEEHEIM & S.VALLEY	24X36	30	24	ACMP	44	992.96	992.82	0.003182	33.41	69.3	29.7	0.77	0.33	90	2	4.9087	33.41	0.024	995.96	994.82	0.5	0.64	0.01455	1.16	42.53514	8.6652	0.5835	33.41
19.03.16	BEEHEIM & S.VALLEY	24X36	30	24	ACMP	44	993.08	992.94	0.003182	33.41	69.3	29.7	0.77	0.33	90	2	4.9087	33.41	0.024	996.08	994.94	0.5	0.64	0.01455	1.16	42.53514	8.6652	0.5835	33.41
19.03.05	BEEHEIM & RAINBOW	18X24	21	18	ACMP	44	1001.25	1000.99	0.005909	14.1776	23.1	9.9	0.77	0.33	30	1.5	2.4053	14.1776	0.024	1003.5	1002.5	0.5	0.51	0.01159	0.915	14.668	6.0982	0.289	14.178
19.03.06	BEEHEIM & RAINBOW	18X24	21	18	ACMP	44	1001.15	1000.87	0.006364	14.1776	23.1	9.9	0.77	0.33	30	1.5	2.4053	14.1776	0.024	1003.4	1002.4	0.5	0.53	0.01205	0.915	14.95284	6.2167	0.3003	14.178
19.03.07	BEEHEIM & RAINBOW	18X24	21	18	ACMP	44	1001.31	1000.89	0.009545	14.1776	23.1	9.9	0.77	0.33	30	1.5	2.4053	14.1776	0.024	1003.56	1002.4	0.5	0.67	0.01523	0.915	16.81215	6.9929	0.3797	14.178
19.03.08	RAINBOW CT	21X27	24	21	ACMP	44	1009.65	1008.94	0.016136	20.0014	23.1	9.9	0.77	0.33	30	1.75	3.1416	20.0014	0.024	1012.28	1010.7	0.5	1.085	0.02466	1	30.54541	9.7229	0.7347	20.001
19.03.04	HIDDEN	21X27	24	21	CMP	44	985.63	985.35	0.006364	20.0014	31.6	14.6	1.58	0.73	20	1.75	3.1416	20.0014	0.024	988.255	987.1	0.5	0.655	0.01489	1	23.73295	7.5544	0.4435	20.001
19.03.02	HILLVIEW	24X36	30	24	ACMP	44	972.51	972.27	0.005455	33.41	31.6	14.6	1.58	0.73	20	2	4.9087	33.41	0.024	975.51	974.27	0.5	0.74	0.01682	1.16	45.7363	9.7176	0.6747	33.41
19.03.17	LAWNSPACE	24	24	24	CMP	62	954.83	954.51	0.005161	21.3824	15.8	7.3	1.58	0.73	10	2	3.1416	21.3824	0.024	957.83	956.51	0.5	0.82	0.01323	1	22.37013	7.1206	0.394	21.382
19.03.18	LAWNSPACE	24X36	30	24	CMP	40	937.76	936.65	0.027750	33.41	47.4	21.9	1.58	0.73	30	2	4.9087	33.41	0.024	940.76	938.65	0.5	1.61	0.04025	1.16	70.75663	14.414	1.6147	33.41
20.03.02	RACINE & OBSERVATORY	24	24	24	ACMP	64	913	912.84	0.002500	21.0571	11.1	4.3	1.11	0.43	10	2	3.1416	21.3824	0.024	916	914.84	0.41	0.75	0.01172	1	21.05708	6.7027	0.3491	21.057
20.03.03	RACINE	30	30	30	CMP	92	912.71	907.49	0.056739	37.3535	33.3	12.9	1.11	0.43	30	2.5	4.9087	37.3535	0.024	916.46	909.99	1.2	5.27	0.05728	1.16	84.41032	17.136	2.2979	37.354
20.03.01	RACINE & LAWNSDALE	24	24	24	CMP	124	901.92	901.69	0.001855	17.2926	33.3	12.9	1.11	0.43	30	2	3.1416	21.3824	0.024	904.92	903.69	0.25	0.98	0.0079	1	17.29257	5.5044	0.2355	17.293
20.02.01	RACINE & 30' DRAINAGE	24	24	24	CCP	214	921.09	919.41	0.007850	21.3824	28.5	12.9	0.95	0.43	30	2	3.1416	21.3824	0.013	924.09	921.41	0.65	2.03	0.00949	1	34.9757	11.133	0.9632	21.382
20.02.02	RACINE & 30' DRAINAGE	24	24	24	RCP	319	919.41	916.37	0.009530	21.3824	28.5	12.9	0.95	0.43	30	2	3.1416	21.3824	0.013	922.41	918.37	0.69	3.35	0.0105	1	36.80039	11.714	1.0663	21.382
21.01.01	OBSERVATORY & WOELFEL	36X72	48	36	ACMP	42	885.25	884.91	0.008095	104.752	343	239	1.41	0.62	660	3	12.566	104.752	0.024	889.75	887.91	1.24	0.6	0.01429	1.587	147.6234	11.747	1.0725	104.75
21.01.02	OBSERVATORY & WOELFEL	21X30	24	30	ARCP	120	898.62	898.42	0.001667	18.708	308	166	1.41	0.62	660	2.5	3.1416	23.9063	0.024	902.37	900.92	0.34	1.11	0.00925	1	18.70804	5.955	0.2756	18.708
21.01.03	OBSERVATORY & JOHNS	72X102	84	72	ACMP	40	875.16	874.63	0.013250	453.684	556	193	1.36	0.59	1700	6	38.485	453.684	0.024	884.16	880.63	3.25	2.28	0.007	2.305	459.5733	11.942	1.1082	453.68
21.01.04	JOHNS & ELM	20X30	24	20	ACMP	45	871.17	870.1	0.023778	19.5194	27.2	11.8	1.36	0.59	20	1.6667	3.1416	19.5194	0.024	873.67	871.77	0.76	1.143	0.02541	1	31.00542	8.8693	0.7569	19.519
21.01.09	CALHOUN & JILLS	21X30	24	21	ACMP	139	877.02	876.17	0.006115	18.8476	27.2	11.8	1.36	0.59	20	1.75	3.1416	20.0014	0.024	879.645	877.92	0.42	1.305	0.00939	1	18.84757	5.9994	0.2797	18.848
22.03.01	CALHOUN	24	24	24	CMP	41	877.69	877.55	0.003415	21.3824	23.1	14.7	0.77	0.49	30	2	3.1416	21.3824	0.024	880.69	879.55	0.48	0.66	0.0161	1	24.67956	7.8557	0.4796	21.382
22.03.02	CALHOUN & SALENTINE	18X30	24	18	ACMP	60	878.55	878.36	0.003167	18.2818	23.1	14.7	0.77	0.49	30	1.5	3.1416	18.5177	0.024	880.8	879.86	0.41	0.53	0.00883	1	18.28183	5.8193	0.2632	18.282
22.03.12	MARY ROSS & CALDWELL	18X30	24	18	ACMP	45	873.94	873.29	0.014444	18.5177	34.8	20.7	1.16	0.69	30	1.5	3.1416	18.5177	0.024	876.19	874.79	0.48	0.92	0.02044	1	27.81282	8.8531	0.6091	18.518
22.03.17	MARY ROSS & CALDWELL	18X30	24	18	ACMP	45	873.5	873.01	0.010889	18.5177	34.8	20.7	1.16	0.69	30	1.5	3.1416	18.5177	0.024	875.75	874.51	0.25	0.99	0.022	1	28.85153	9.1837	0.6554	18.518
22.03.16	MARY ROSS & CALDWELL	24	24	24	ACMP	45	873.19	872.74	0.010000	21.3824	34.8	20.7	1.16	0.69	30	2	3.1416	21.3824	0.024	876.19	874.74	0.48	0.97	0.02156	1.16	28.55861	9.0905	0.6422	21.382
22.03.15	MARY ROSS & MARIETTA	21X27	24	21	ACMP	44	875.16	874.67	0.011136	20.0014	34.8	20.7	1.16	0.69	30	1.75	3.1416	20.0014	0.024	877.785	876.42	0.35	1.015	0.02307	1	29.54365	9.404	0.6873	20.001
22.03.03	SALENTINE & CALDWELL	18X30	24	18	ACMP	47	851.24	850.87	0.007872	18.5177	46.4	27.6	1.16	0.69	40	1.5	3.1416	18.5177	0.024	853.49	852.37	0.41	0.71	0.01511	1	23.90769	7.6101	0.4501	18.518
22.03.04	SALENTINE & CALDWELL	24X36	30	24	ACMP	45	850.77	850.05	0.016000	33.41	69.6	41.4	1.16	0.69	60	2	4.9087	33.41	0.024	853.77	852.05	0.75	0.97	0.02156	1.16	51.78021	10.549	0.8647	33.41
22.03.05	SALENTINE & CALDWELL	24X36	30	24	ACMP	45	850.67	850.29	0.008444	33.41	69.6	41.4	1.16	0.69	60	2	4.9087	33.41	0.024	853.67	852.29	0.62	0.76	0.01689	1.16	45.83368	9.3372	0.6775	33.41
22.02.02	CALHOUN S. OF OBSERVATORY	24	24	24	CMP	25	915.17	913.17	0.080000	21.3824	38	17.2	0.95	0.43	40	2	3.1416	21.3824	0.024	918.17	915.17	1.6	1.4	0.056	1	46.03111	14.652	1.6684	21.382
22.03.26	NATIONAL	30X40	34	30	RCP	424	921.96	921.45	0.001203	47.9785	11.4	5.1	1.14	0.51	10	2.5	6.305	47.9785	0.013	925.71	923.95	0.42	1.34	0.00316	1.261	51.1064	8.1057	0.5106	47.979
22.03.27	NATIONAL	30X40	34	30	RCP	40	921.45	921.37	0.002000	47.9785	11.4	5.1	1.14	0.51	10	2.5	6.305	47.9785	0.013	925.2	923.87	0.75	0.58	0.0145	1.261	109.4687	17.362	2.3426	47.979
22.03.28	NATIONAL	18X27	22	18	ACMP	41	916.6	916.3	0.007317	15.56	34.2	15.3	1.14	0.51	30	1.5	2.6398	15.56	0.024	918.85	917.8	0.42	0.63	0.01537	0.944	19.11905	7.2426	0.4076	15.56
22.01.06	MAYFLOWER & KATHERINE	18X27	22	18	ACMP	42	895.04	894.91	0.003095	15.56	16.5	8.1	1.65	0.81	10	1.5	2.6398	15.56	0.024	897.29	896.41	0.36	0.52	0.01238	0.944	17.16188	6.5012	0.3285	15.56
23.03.01	SUNNY SLOPE (S OF HOWARD)	36	36	36	RCP	55	880.73	880.14	0.010727	58.923	49.5	24.3	1.65	0.81	30	3	7.0686	58.923	0.013	885.23	883.14	1.25	0.84						

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
24.01.13	WEATHERSTONE	38X57	48	38	CMPA	78	817.9	816.72	0.015128	107.622	73	25	1.9	0.76	50	3.1667	12.566	107.622	0.024	822.65	819.89	1.25	1.513	0.0194	1.587	172.0379	13.69	1.4565	107.62
24.01.14	SOUTH VICTORIA CIRCLE	39X56	54	39	ACMP	81	846.15	846.11	0.000494	137.99	28	10	1.9	0.76	30	3.25	15.904	137.99	0.024	851.025	849.36	0.86	0.805	0.00994	1.717	168.5646	10.599	0.873	137.99
24.01.15	SOUTH VICTORIA CIRCLE	42X64	54	42	ACMP	81	846.49	846.29	0.002469	143.199	28	10	1.9	0.76	30	3.5	15.904	143.199	0.024	851.74	849.79	0.95	1	0.01235	1.717	187.8748	11.813	1.0844	143.2
24.01.16	COLD SPRING RD & S. VICTORIA	24	24	24	CMP	47	844.87	844.64	0.004894	21.3824	19	7.6	1.9	0.76	10	2	3.1416	21.3824	0.024	847.87	846.64	0.48	0.75	0.01596	1	24.57192	7.8215	0.4754	21.382
24.04.17	124TH	69X72	70	69	CONC	66	794.57	793.69	0.013333	308.425	142	51	1.9	0.76	75	5.75	26.725	308.425	0.013	803.195	799.44	2.75	1.005	0.01523	2.041	769.5462	28.795	6.4433	308.42
24.04.18	WEATHERSTONE	43X64	54	43	CMP	80	838.88	837.96	0.011500	144.894	76	30.4	1.9	0.76	40	3.5833	15.904	144.894	0.024	844.255	841.54	1.25	1.462	0.01827	1.717	228.5547	14.371	1.6049	144.89
24.04.19	WEATHERSTONE	38X57	48	38	CMP	80	838.86	837.96	0.011250	107.622	76	30.4	1.9	0.76	40	3.1667	12.566	107.622	0.024	843.61	841.13	1.25	1.233	0.01542	1.587	153.3555	12.204	1.1574	107.62
25.04.03	BALBOA AND GRANGE	30X42	36	30	ACMP	40	856.51	855.9	0.015250	53.7891	174.6	59.4	1.94	0.66	90	2.5	7.0686	53.7891	0.024	860.26	858.4	1.25	0.61	0.01525	1.31	70.82215	10.019	0.7801	53.789
25.04.04	GRANGE & DRAINAGE EASEMENT	48X96	74	48	CMP	37	813.8	813.51	0.007838	287.483	174.6	59.4	1.94	0.66	90	4	29.867	287.483	0.024	819.8	817.51	1.25	1.04	0.02811	2.118	656.7922	21.991	3.7581	287.48
25.04.05	GRANGE & DRAINAGE EASEMENT	48X96	74	48	CMP	37	813.8	813.51	0.007838	287.483	174.6	59.4	1.94	0.66	90	4	29.867	287.483	0.013	819.8	817.51	0.5	1.79	0.04838	2.118	1590.764	53.262	22.045	287.48
25.04.17	GREENTREE AND GRANGE	36X48	42	36	ACMP	50	832.51	832.49	0.000400	80.2007	224	72.6	1.94	0.66	110	3	9.6211	80.2007	0.024	837.01	835.49	0.95	0.57	0.0114	1.452	92.36585	9.6003	0.7162	80.201
25.04.34	GREENTREE & CORTEZ	48X180	115	48	ACMP	45	843.6	843.6	0.000000	694.296	776	264	1.94	0.66	400	4	72.131	694.296	0.024	849.6	847.6	1.45	0.55	0.01222	2.842	1403.343	19.455	2.9415	694.3
25.04.18	CORTEZ AND GREENTREE	21	21	21	CMP	41	829.92	829.9	0.000488	15.3136	38.8	13.2	1.94	0.66	20	1.75	2.4053	15.3136	0.024	832.545	831.65	0.34	0.555	0.01354	0.915	15.85137	6.5902	0.3375	15.314
25.04.14	CORTEZ AND MARQUETTE	39X56	48	39	ACMP	40	832.54	831.49	0.026250	109.029	95	47	2.44	0.71	130	3.25	12.566	109.029	0.024	837.415	834.74	1.29	1.385	0.03462	1.587	229.826	18.289	2.5994	109.03
25.04.15	CORTEZ AND MARQUETTE	39X56	48	39	ACMP	40	832.28	831.32	0.024000	109.029	95	47	2.44	0.71	130	3.25	12.566	109.029	0.024	837.155	834.57	1.75	0.835	0.02087	1.587	178.4504	14.201	1.5671	109.03
25.04.16	CORTEZ AND MARQUETTE	39X56	48	39	ACMP	40	832.27	831.34	0.023250	109.029	95	47	2.44	0.71	130	3.25	12.566	109.029	0.024	837.145	834.59	1.25	1.305	0.03262	1.587	223.0897	17.753	2.4492	109.03
25.04.11	MARQUETTE AND BALBOA	24X36	30	24	ACMP	45	836.83	836.05	0.017333	33.41	97.6	28.4	2.44	0.71	40	2	4.9087	33.41	0.024	839.83	838.05	0.75	1.03	0.02289	1.16	53.35763	10.87	0.9182	33.41
25.04.10	MARQUETTE AND BALBOA	32X48	42	32	ACMP	43	837.33	836.35	0.022791	75.614	97.6	28.4	2.44	0.71	40	2.6667	9.6211	75.614	0.024	841.33	839.02	1.57	0.743	0.01729	1.452	113.7409	11.822	1.0861	75.614
25.04.12	MARQUETTE AND MAGELLAN	24	24	24	CMP	40	842.88	842.22	0.016500	21.3824	146.4	42.6	2.44	0.71	60	2	3.1416	21.3824	0.024	845.88	844.22	0.64	1.02	0.0255	1	31.06187	9.8873	0.7597	21.382
25.04.08	BALBOA AND RIVERWAY	36X39	36	36	ACMP	44	838.76	838.09	0.015227	58.923	118	62.5	2.44	0.71	190	3	7.0686	58.923	0.024	843.26	841.09	1.12	1.05	0.02386	1.31	88.59363	12.533	1.2208	58.923
25.04.09	BALBOA AND RIVERWAY	36X39	36	36	ACMP	44	838.6	838.26	0.007727	58.923	118	62.5	2.44	0.71	190	3	7.0686	58.923	0.024	843.1	841.26	1.21	0.63	0.01432	1.31	68.62433	9.7084	0.7325	58.923
25.04.29	124TH & JOLIET	18X27	22	18	ACMP	43	815.02	814.58	0.010233	15.56	107.3	44.25	1.43	0.59	75	1.5	2.6398	15.56	0.024	817.27	816.08	0.45	0.74	0.01721	0.944	20.23343	7.6647	0.4565	15.56
25.04.30	124TH & JOLIET	27X42	36	27	ACMP	39	813.7	812.63	0.027436	51.0288	107.3	44.25	1.43	0.59	75	2.25	7.0686	51.0288	0.024	817.075	814.88	1.13	1.065	0.02731	1.31	94.77127	13.407	1.3969	51.029
25.04.31	124TH & JOLIET	27X42	36	27	ACMP	39	813.05	812.73	0.008205	51.0288	114.4	47.2	1.43	0.59	80	2.25	7.0686	51.0288	0.024	816.425	814.98	0.84	0.605	0.01551	1.31	71.42982	10.105	0.7936	51.029
25.04.24	124TH & MARQUETTE	24X36	30	24	ACMP	41	815.29	815	0.007073	33.41	100.1	41.3	1.43	0.59	70	2	4.9087	33.41	0.024	818.29	817	0.66	0.63	0.01537	1.16	43.71822	8.9662	0.6164	33.41
25.04.25	124TH & MARQUETTE	24X36	30	24	ARCP	41	815.26	815	0.006341	33.41	100.1	41.3	1.43	0.59	70	2	4.9087	33.41	0.013	818.26	817	0.85	0.41	0.01	1.16	65.11065	13.264	1.3673	33.41
25.01.19	CHERRY TREE AND COURTLAND PARKWAY	36X58	48	36	ACMP	49	841.41	841.16	0.005102	104.752	97	33	1.94	0.66	50	3	12.566	104.752	0.024	845.91	844.16	1.12	0.63	0.01286	1.587	140.0478	11.145	0.9652	104.75
25.01.20	CHERRY TREE AND COURTLAND PARKWAY	36X58	48	36	ACMP	49	841.62	841.04	0.011837	104.752	97	33	1.94	0.66	50	3	12.566	104.752	0.024	846.12	844.04	1.25	0.83	0.01694	1.587	160.7479	12.792	1.2716	104.75
25.01.35	MAGELLAN AND RADISSON	24X36	30	24	ACMP	44	849.88	849.59	0.006591	33.41	38.8	13.2	1.94	0.66	20	2	4.9087	33.41	0.024	852.88	851.59	0.64	0.65	0.01477	1.16	42.86615	8.7326	0.5926	33.41
25.01.10	RADISSON AND COURTLAND PARKWAY	30X50	42	30	ACMP	41	846.67	846.58	0.002195	73.2129	77.6	26.4	1.94	0.66	40	2.5	9.6211	73.2129	0.024	850.42	849.08	0.85	0.49	0.01195	1.452	94.57255	9.8297	0.7509	73.213
25.01.11	RADISSON AND COURTLAND PARKWAY	24X34	30	24	ACMP	40	846.88	846.3	0.014500	33.41	77.6	26.4	1.94	0.66	40	2	4.9087	33.41	0.024	849.88	848.3	0.71	0.87	0.02175	1.16	52.01323	10.596	0.8725	33.41
25.01.12	RADISSON AND COURTLAND PARKWAY	36X58	48	36	ACMP	45	846.95	846.1	0.018889	104.752	122	72.5	1.94	0.66	100	3	12.566	104.752	0.024	851.45	849.1	1.12	1.23	0.02733	1.587	204.1975	16.25	2.052	104.75
25.01.13	RADISSON AND COURTLAND PARKWAY	36X58	48	36	ACMP	44	846.97	846.92	0.001136	104.752	122	72.5	1.94	0.66	100	3	12.566	104.752	0.024	851.47	849.92	0.75	0.8	0.01818	1.587	166.5416	13.253	1.3649	104.75
25.01.23	COURTLAND PARKWAY	18X24	21	18	ACMP	56	854.71	852.53	0.038929	14.1776	155.2	52.8	1.94	0.66	80	1.5	2.4053	14.1776	0.024	856.96	854.03	0.75	2.18	0.03890	0.915	26.88106	11.176	0.9706	14.178
25.01.24	COURTLAND PARKWAY	42X66	48	42	RCP	55	857.04	851.99	0.091818	113.145	155.2	52.8	1.94	0.66	80	3.5	12.566	113.145	0.013	862.29	855.49	2.25	4.55	0.08273	1.587	655.8378	52.19	21.167	113.15
25.01.25	COURTLAND PARKWAY	42X66	48	42	RCP	55	854.83	852.1	0.049636	113.145	77.6	26.4	1.94	0.66	40	3.5	12.566	113.145	0.013	860.08	855.6	1.45	3.03	0.05509	1.587	535.195	42.589	14.096	113.15
25.02.20	I-43 ROCK FREEWAY	30	30	30	CMP	443	868.21	861.23	0.015756	37.3535	190	76	1.9	0.76	100	2.5	4.9087	37.3535	0.024	871.96	863.73	0.02	8.21	0.01853	1.16	48.01245	9.781	0.7435	37.354
25.02.21	I-43 ROCK FREEWAY	24	24	24	CMP	222	857.27	852.98	0.019324	21.3824	38	15.2	1.9	0.76	20	2	3.1416	21.3824	0.024	860.27	854.98	0.56	4.73	0.02131	1	28.39302	9.0378	0.6348	21.382
25.02.22	I-43 ROCK FREEWAY	30	30	30	CMP	247	854.91	851.33	0.014494	37.3535	38	15.2	1.9	0.76	20	2.5	4.9087	37.3535	0.024	858.66	853.83	0.6	4.23	0.01713	1.16	46.15363	9.4023	0.687	37.354
25.02.38	I-43 ROCK FREEWAY & 124th	36	36	36	CMP	110	844.45	845.08	0.003273	58.923	57	22.8	1.9	0.76	30	3	7.0686	58.923	0.024	849.94	84								

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
25.01.27	LANGLADE & MARIN	24	24	24	CMP	41	858.41	857.82	0.014390	21.3824	30.6	11	1.53	0.55	20	2	3.1416	21.3824	0.024	861.41	859.82	0.64	0.95	0.02317	1	29.60924	9.4249	0.6903	21.382
25.01.37	LANGLADE & MARIN	42X66	54	42	RCP	200	856.91	852.1	0.024050	143.199	97.5	60	1.53	0.55	110	3.5	15.904	143.199	0.013	862.16	855.6	0.5	6.06	0.0303	1.717	543.3756	34.165	0.9711	143.2
25.01.38	LANGLADE & MARIN	42X66	54	42	RCP	200	856.57	851.99	0.022900	143.199	97.5	60	1.53	0.55	110	3.5	15.904	143.199	0.013	861.82	855.49	0.5	5.83	0.02915	1.717	532.9643	33.511	0.87268	143.2
25.02.13	LANGLADE & RADISSON	30X42	36	30	ACMP	40	862.3	861.39	0.022750	53.7891	180.8	54.4	2.26	0.68	80	2.5	7.0686	53.7891	0.024	866.05	863.89	1.12	1.04	0.026	1.31	92.47426	13.082	1.33	53.789
25.02.12	MARIN & RADISSON	30X42	36	30	ACMP	40	869.8	868.54	0.031500	53.7891	135.8	46.2	1.94	0.66	70	2.5	7.0686	53.7891	0.024	873.55	871.04	1.25	1.26	0.0315	1.31	101.7863	14.4	1.6114	53.789
25.02.01	RADISSON & MENARD	24X36	30	24	ACMP	40	881.64	880.16	0.037000	33.41	45.2	13.6	2.26	0.68	20	2	4.9087	33.41	0.024	884.64	882.16	1.12	1.36	0.034	1.16	65.03148	13.248	1.3639	33.41
25.02.02	RADISSON & MENARD	18X27	21	18	ACMP	45	882.8	880.96	0.040889	14.1776	116.4	39.6	1.94	0.66	60	1.5	2.4053	14.1776	0.024	885.05	882.46	0.78	1.81	0.04022	0.915	27.32406	11.36	1.0029	14.178
25.02.03	RADISSON & GUERIN	30X42	36	30	ACMP	51	896.57	895.17	0.027451	53.7891	97	33	1.94	0.66	50	2.5	7.0686	53.7891	0.024	900.32	897.67	1.14	1.51	0.02961	1.31	98.68192	13.961	1.5146	53.789
25.02.04	GUERIN & LOTUS	24X36	30	24	ACMP	45	899.67	899.49	0.004000	33.41	97	33	1.94	0.66	50	2	4.9087	33.41	0.024	902.67	901.49	0.57	0.61	0.01356	1.16	41.06226	8.3651	0.5438	33.41
25.02.05	LOTUS	30X42	36	30	ACMP	63	904.02	903.15	0.013810	53.7891	77.6	26.4	1.94	0.66	40	2.5	7.0686	53.7891	0.024	907.77	905.65	0.89	1.23	0.01952	1.31	80.13394	11.337	0.9988	53.789
26.03.05	GRANGE	48	48	48	CMP	46	860.62	860.29	0.007174	120.957	183	129	0.84	0.4	240	4	12.566	120.957	0.024	866.62	864.29	1.25	1.08	0.02348	1.587	189.2506	15.06	1.7626	120.96
26.03.06	SMALL, 352250N, 2508750E	24	24	24	CMP	60	921.05	920.3	0.012500	21.3824	8.4	4	0.84	0.4	10	2	3.1416	21.3824	0.024	924.05	922.3	0.56	1.19	0.01983	1	27.39399	8.7198	0.5909	21.382
26.03.01	SUNNY SLOPE	20X30	24	20	ARCP	60	914.17	913.19	0.016333	19.5194	15.2	6.2	1.52	0.62	10	1.6667	3.1416	19.5194	0.013	916.67	914.86	0.95	0.863	0.01439	1	43.07636	13.712	1.4611	19.519
26.03.02	SUNNY SLOPE & BELOIT	24	24	24	CMP	62	905.76	905.51	0.004032	21.3824	30.4	12.4	1.52	0.62	20	2	3.1416	21.3824	0.024	908.76	907.51	0.42	0.83	0.01339	1	22.50612	7.1639	0.3988	21.382
26.03.04	BELOIT & SMALL	24X36	30	24	ACMP	55	894.65	893.78	0.015818	33.41	18.8	10.8	1.88	1.08	10	2	4.9087	33.41	0.024	897.65	895.78	0.75	1.12	0.02036	1.16	50.32825	10.253	0.8169	33.41
26.04.03	GRANGE	27X42	36	27	ACMP	42	879.25	876.25	0.071429	51.0288	23.2	11.2	0.58	0.28	40	2.25	7.0686	51.0288	0.024	882.625	878.5	3.54	0.585	0.01393	1.31	67.68423	9.5754	0.7125	51.029
26.04.01	GRANGE & SUNNY SLOPE	18X30	24	18	ARCP	56	875.55	875.03	0.009286	18.5177	34.8	16.8	0.58	0.28	60	1.5	3.1416	18.5177	0.013	877.53	876.53	0.52	0.75	0.01339	1	41.5587	13.229	1.3599	18.518
26.04.02	GRANGE & SUNNY SLOPE	18X30	24	18	ARCP	83	899.71	898.11	0.019277	12.4648	34.8	16.8	0.58	0.28	60	1.5	3.1416	18.5177	0.013	901.96	899.61	2.25	0.1	0.0012	1	12.46483	3.9677	0.1223	12.465
26.02.12	MOORLAND	48	48	48	RCP	94	862.5	862.01	0.005213	120.957	56.4	32.4	1.88	1.08	30	4	12.566	120.957	0.013	868.5	866.01	1.25	1.24	0.01319	1.587	261.8901	20.841	3.3753	120.96
26.02.13	MOORLAND	48	48	48	RCP	94	862.49	862.02	0.005000	120.957	37.6	21.6	1.88	1.08	20	4	12.566	120.957	0.013	868.49	866.02	1.51	0.96	0.01021	1.587	230.4325	18.337	2.6131	120.96
26.02.11	MOORLAND	48	48	48	RCP	182	861.17	860.75	0.002308	120.957	37.6	21.6	1.88	1.08	20	4	12.566	120.957	0.013	867.17	864.75	1.45	0.97	0.00533	1.587	166.4647	13.247	1.3637	120.96
26.02.14	MOORLAND	48	48	48	RCP	182	861.1	860.77	0.001813	120.957	56.4	32.4	1.88	1.08	30	4	12.566	120.957	0.013	867.1	864.77	1.35	0.98	0.00538	1.587	167.3206	13.315	1.3777	120.96
26.02.08	MOORLAND & I-43	24	24	24	RCP	184	862.49	861.63	0.004674	21.3824	56.4	32.4	1.88	1.08	30	2	3.1416	21.3824	0.013	865.49	863.63	0.53	1.33	0.00723	1	30.53109	9.7183	0.734	21.382
26.02.09	MOORLAND	48	48	48	RCP	429	865.3	862.08	0.007506	120.957	122	58.5	2.88	1.65	30	4	12.566	120.957	0.013	871.3	866.08	1.46	3.76	0.00876	1.587	213.4703	16.987	2.2426	120.96
26.02.10	MOORLAND	48	48	48	RCP	428	865.39	862.23	0.007383	120.957	122	58.5	2.88	1.65	30	4	12.566	120.957	0.013	871.39	866.23	1.46	3.7	0.00864	1.587	212.0074	16.871	2.2119	120.96
26.02.07	BELOIT & I-43	52	52	52	CMP	84	881.66	881.64	0.000238	137.231	115.2	66	2.88	1.65	40	4.3333	14.748	147.753	0.024	888.16	885.97	1.51	0.677	0.00806	1.674	137.2306	9.305	0.6729	137.23
26.01.07	BELOIT & I-43	30	30	30	CMP	132	875.65	875.07	0.004394	36.0609	52	29	2.88	1.65	40	2.5	4.9087	37.3535	0.024	879.4	877.57	0.45	1.38	0.01045	1.16	36.06092	7.3463	0.4194	36.061
26.02.15	I-43	24	24	24	RCP	143	885.73	882.08	0.025524	21.3824	25	7	1.16	0.69	60	2	3.1416	21.3824	0.013	888.73	884.08	1.35	3.3	0.02308	1	54.55245	17.365	2.3432	21.382
26.02.16	I-43	42	42	42	RCP	269	881.25	880.75	0.001859	86.6267	103	28	1.16	0.69	70	3.5	9.6211	86.6267	0.013	888.16	884.25	0.85	1.4	0.0052	1.452	115.2165	11.975	1.1145	86.627
26.02.17	MOORLAND	36X58	48	36	CONC	55	867.96	867.7	0.004727	104.752	69.6	41.4	1.16	0.69	60	3	12.566	104.752	0.013	872.46	870.7	1.23	0.53	0.00964	1.587	223.8354	17.812	2.4656	104.75
26.02.18	MOORLAND	36X58	48	36	CONC	55	867.96	867.7	0.004727	104.752	69.6	41.4	1.16	0.69	60	3	12.566	104.752	0.013	872.46	870.7	0.05	1.71	0.03109	1.587	402.0581	31.995	7.9551	104.75
27.01.01	CALHOUN	48X60	52	48	ACMP	47	827.45	827.36	0.001915	141.957	207	155	2.09	1.17	500	4	14.748	141.957	0.024	833.45	831.36	1.25	0.84	0.01787	1.674	204.4061	13.86	1.4928	141.96
27.01.02	CALHOUN	48X60	52	48	ACMP	47	827.44	827.12	0.006809	141.957	207	155	2.09	1.17	500	4	14.748	141.957	0.024	833.44	831.12	1.75	0.57	0.01213	1.674	168.3804	11.417	1.013	141.96
27.01.03	ROCK I-43	30	30	30	RCP	188	897.55	895.42	0.011330	37.3535	40.8	20.4	2.09	1.17	20	2.5	4.9087	37.3535	0.013	901.3	897.92	0.95	2.43	0.01293	1.16	74.02464	15.408	1.7673	37.354
27.02.02	BELOIT	20X30	24	20	ACMP	42	853.28	852.75	0.012619	19.5194	41.8	23.4	2.09	1.17	20	1.6667	3.1416	19.5194	0.024	855.78	854.42	0.55	0.813	0.01937	1	27.06868	8.6162	0.5769	19.519
27.02.01	BELOIT	20X30	24	20	ACMP	38	864.96	863.65	0.034474	19.5194	41.8	23.4	2.09	1.17	20	1.6667	3.1416	19.5194	0.024	867.46	865.32	0.75	1.393	0.03667	1	37.24716	11.856	1.0924	19.519
27.01.04	BELOIT & CALHOUN	56X132	48	56	RCP	31	837.98	837.78	0.006452	130.649	840	400	0.84	0.4	1000	4.6667	12.566	130.649	0.024	844.98	842.45	0.56	1.993	0.03666	1.587	31.61787	24.798	4.7788	130.65
27.02.04	BELOIT	48	48	48	RCP	70	845.8	844	0.025714	120.957	41.8	23.4	2.09	1.17	20	4	12.566	120.957	0.024	851.8	848	0.55	3.25	0.04643	1.587	266.1319	21.178	3.4855	120.96
27.04.05	ROCK I-43	24	24	24	RCP	84	893.48	893.1	0.004524	21.3824	56.4	32.4	1.88	1.08	30	2	3.1416	21.3824	0.013	896.48	895.1	0.65	0.73	0.00869	1	33.47705	10.656	0.8824	21.382
27.04.06	I-43 & MOORLAND	48	48	48	RCP	112	860.82	860.52	0.002679	120.957	252	127	1.88	1.08	130	4	12.566	120.957	0.013	866.82	864.52	1.5	0.8	0.00714	1.587	192.71			

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
28.03.09	EGOFSKE & BERES	24X36	30	24	ACMP	86	837.84	836.46	0.016047	33.41	65.4	37.2	1.09	0.62	60	2	4.9087	33.41	0.024	840.84	838.46	0.75	1.63	0.01895	1.16	48.55442	9.8914	0.7603	33.41
28.03.08	BERES & MARTIN	20X30	24	20	ACMP	20	837.5	837.07	0.021500	19.5194	43.6	24.8	1.09	0.62	40	1.6667	3.1416	19.5194	0.024	840	838.74	0.85	0.413	0.02067	1	27.96357	8.9011	0.6157	19.519
28.04.05	SATURN	21X27	24	21	ACMP	41	863.42	862.83	0.014390	20.0014	34.5	24	1.15	0.8	30	1.75	3.1416	20.0014	0.024	866.045	864.58	0.6	0.865	0.0211	1	28.25359	8.9934	0.6285	20.001
28.04.10	STEVEN	20X30	24	20	ACMP	40	843.92	843.84	0.002000	19.5194	32.7	18.6	1.09	0.62	30	1.6667	3.1416	19.5194	0.024	846.42	845.51	0.01	0.513	0.01283	1	22.03572	7.0142	0.3823	19.519
28.04.15	BERES	27X42	32	27	ACMP	33	835.5	835.12	0.011515	40.3191	87.2	49.6	1.09	0.62	80	2.25	5.5851	40.3191	0.024	838.875	837.37	0.85	0.655	0.01985	1.211	59.0189	10.567	0.8678	40.319
28.04.14	BERES	60	60	60	CMP	33	825.95	825.85	0.003030	211.303	225	200	1.09	0.62	1800	5	19.635	211.303	0.024	833.45	830.85	1.95	0.65	0.0197	1.842	314.2901	16.007	1.9911	211.3
28.04.13	BERES	60	60	60	CMP	33	826.01	825.91	0.003030	211.303	225	200	1.09	0.62	1800	5	19.635	211.303	0.024	833.51	830.91	1.95	0.65	0.0197	1.842	314.2901	16.007	1.9911	211.3
28.02.09	NATIONAL & LAWNSDALE	24	24	24	CMP	33	893.82	891.82	0.060606	21.3824	8.7	5.4	0.87	0.54	10	2	3.1416	21.3824	0.024	896.82	893.82	1.45	1.55	0.04697	1	42.15667	13.419	1.3993	21.382
28.02.13	BELOIT & TRIBUTARY	30X42	34	30	ACMP	40	843.05	842.71	0.008500	47.9785	226.2	140.4	0.87	0.54	260	2.5	6.305	47.9785	0.024	846.8	845.21	0.85	0.74	0.0185	1.261	66.97671	10.623	0.8769	47.979
29.04.04	NATIONAL & EGOFSKE	42X60	52	42	ACMP	64	918.6	918.4	0.003125	132.788	61.6	39.2	0.77	0.49	80	3.5	14.748	132.788	0.024	923.85	921.9	1.12	0.83	0.01297	1.674	174.1214	11.806	1.0832	132.79
29.01.06	EGOFSKE & OVERLOOK	27	27	27	RCP	40	898.87	897	0.046750	28.7037	77	49	0.77	0.49	100	2.25	3.9761	28.7037	0.013	902.245	899.25	2.45	0.545	0.01363	1.082	57.38526	14.433	1.6187	28.704
29.02.01	LAWNSDALE	30	30	30	CMP	41	888.09	885.83	0.055122	37.3535	133	60.2	0.95	0.43	140	2.5	4.9087	37.3535	0.024	891.84	888.33	1.75	1.76	0.04293	1.16	73.07159	14.886	1.7221	37.354
29.02.02	LAWNSDALE	24	24	24	CCP	41	888.58	888.55	0.000732	20.9844	133	60.2	0.95	0.43	140	2	3.1416	21.3824	0.013	891.58	890.55	0.89	0.14	0.03041	1	20.98444	6.6796	0.3467	20.984
29.01.03	PINEWOOD	24	24	24	CMP	40	931.03	930.3	0.018250	21.3824	19	8.6	0.95	0.43	20	2	3.1416	21.3824	0.024	934.03	932.3	0.67	1.06	0.0265	1	31.65606	10.079	0.7895	21.382
29.01.07	CREST	24X36	30	24	CMP	43	936.79	936.17	0.014419	33.41	28.5	12.9	0.95	0.43	30	2	4.9087	33.41	0.024	939.79	938.17	0.85	0.77	0.01791	1.16	47.19493	9.6145	0.7184	33.41
29.01.08	CREST	24	24	24	CMP	41	938.3	937.99	0.007561	21.3824	9.5	4.3	0.95	0.43	10	2	3.1416	21.3824	0.024	941.3	939.99	0.54	0.77	0.01878	1	26.65698	8.4852	0.5595	21.382
29.01.01	LAWNSDALE	24	24	24	CMP	78	911.79	909.27	0.032308	21.3824	7.6	3.8	0.76	0.38	10	2	3.1416	21.3824	0.024	914.79	911.27	0.75	2.77	0.03551	1	36.65642	11.668	1.058	21.382
29.01.02	LAWNSDALE	24	24	24	CMP	61	908.95	907.77	0.019344	21.3824	30.4	15.2	0.76	0.38	40	2	3.1416	21.3824	0.024	911.95	909.77	0.85	1.33	0.0218	1	28.72224	9.1426	0.6496	21.382
30.01.01	EDINBOURGH	32X52	42	32	ACMP	46	888.8	888.11	0.015000	75.614	153.6	72	0.96	0.45	160	2.6667	9.6211	75.614	0.024	892.8	890.78	1.15	0.873	0.01899	1.452	119.1983	12.389	1.1928	75.614
30.01.02	LAWNSDALE	60	60	60	CMP	50	927.19	925.88	0.026200	211.303	153.6	72	0.96	0.45	160	5	19.635	211.303	0.024	934.69	930.88	2.51	1.3	0.026	1.842	361.0918	18.39	2.6282	211.3
31.04.03	GLENGARRY & OXFORD	21	21	21	CMP	40	980.21	979.9	0.007750	14.8467	19.2	9	0.96	0.45	20	1.75	2.4053	15.3136	0.024	982.835	981.65	0.71	0.475	0.01188	0.915	14.84667	6.1725	0.2961	14.847
31.02.05	OXFORD & EDINBOURGH	21	21	21	CMP	41	968.67	967.97	0.017073	15.3136	9.6	4.5	0.96	0.45	10	1.75	2.4053	15.3136	0.024	971.295	969.72	0.58	0.995	0.02427	0.915	21.22423	8.824	0.6051	15.314
31.02.06	OXFORD & EDINBOURGH	24	24	24	CMP	40	968.26	967.66	0.015000	21.3824	9.6	4.5	0.96	0.45	10	2	3.1416	21.3824	0.024	971.26	969.66	0.67	0.93	0.02325	1	29.65985	9.441	0.6927	21.382
31.02.07	EDINBOURGH & ANDREWS	21X27	24	21	ACMP	46	948.85	948.57	0.006087	20.0014	19.2	9	0.96	0.45	20	1.75	3.1416	20.0014	0.024	951.475	950.32	0.45	0.705	0.01533	1	24.08092	7.6652	0.4566	20.001
31.02.08	EDINBOURGH & LOCHLEVEN	30X42	34	30	ACMP	38	942.26	942.05	0.005526	46.5785	28.8	13.5	0.96	0.45	30	2.5	6.305	47.9785	0.024	946.01	944.55	1.12	0.84	0.00895	1.261	46.57851	7.3875	0.4241	46.579
31.02.09	EDINBOURGH & LOCHLEVEN	30X42	34	30	ACMP	38	942.01	941.58	0.011316	47.9785	28.8	13.5	0.96	0.45	30	2.5	6.305	47.9785	0.024	945.76	944.08	0.85	0.83	0.02184	1.261	72.7755	11.543	1.0354	47.979
31.02.10	LOCHLEVEN & MACGREGOR	18X24	21	18	ACMP	49	953.17	951.59	0.032245	14.1776	9.6	4.5	0.96	0.45	10	1.5	2.4053	14.1776	0.024	955.42	953.09	0.76	1.57	0.03204	0.915	24.38732	10.139	0.7989	14.178
31.02.10	EDINBOURGH & ABERDEEN	32X52	38	32	ACMP	48	918.55	917.44	0.023125	61.8972	57.6	27	0.96	0.45	60	2.6667	7.8758	61.8972	0.024	922.55	920.11	1.12	1.323	0.02757	1.358	109.9929	13.966	1.5158	61.897
31.02.19	EDINBOURGH & LOCHINVAR	36X50	42	36	ACMP	46	910.54	909.92	0.013478	80.2007	67.2	31.5	0.96	0.45	70	3	9.6211	80.2007	0.024	915.04	912.92	1.15	0.97	0.02109	1.452	125.6221	13.057	1.3249	80.201
31.02.15	EDINBOURGH & LOCHINVAR	27X42	34	27	ACMP	47	911.53	910.57	0.020426	45.5164	38.4	18	0.96	0.45	40	2.25	6.305	45.5164	0.024	914.905	912.82	1.12	0.965	0.02053	1.261	70.55904	11.191	0.9732	45.516
31.02.16	EDINBOURGH & YARTAN	36X50	40	36	ACMP	48	905.86	905.6	0.005417	72.7444	76.8	36	0.96	0.45	80	3	8.7266	72.7444	0.024	910.36	908.6	0.99	0.77	0.01604	1.406	96.20085	11.024	0.9444	72.744
31.02.17	EDINBOURGH	45X53	48	45	ACMP	40	903.93	903.11	0.020500	117.116	96	45	0.96	0.45	100	3.75	12.566	117.116	0.024	909.555	906.86	0.99	1.705	0.04262	1.587	254.9978	20.292	3.1999	117.12
31.03.08	NATIONAL	24	24	24	ACMP	50	977.3	976.85	0.009000	21.3824	23.8	11.4	1.19	0.57	20	2	3.1416	21.3824	0.024	980.3	978.85	0.53	0.92	0.0184	1	26.38556	8.9988	0.5482	21.382
31.03.01	ABERDEEN	39X58	46	39	ACMP	64	964.47	964.05	0.006563	100.133	47.8	22.8	1.19	0.57	40	3.25	11.541	100.133	0.024	969.345	967.3	0.95	1.095	0.01711	1.543	144.2222	12.497	1.2136	100.13
31.03.02	ABERDEEN	36X48	42	36	ACMP	65	964.72	964.53	0.002923	80.2007	47.6	22.8	1.19	0.57	40	3	9.6211	80.2007	0.024	969.22	967.53	0.75	0.94	0.01446	1.452	104.0318	10.813	0.9086	80.201
31.03.25	GLENGARRY	24	24	24	CMP	50	977.3	976.85	0.009000	21.3824	35.7	17.1	1.19	0.57	30	2	3.1416	21.3824	0.024	980.3	978.85	0.54	0.91	0.0182	1	26.24177	8.353	0.5422	21.382
31.02.25	GLENGARRY	27X42	36	27	ACMP	40	975.37	974.28	0.027250	51.0288	19.2	9	0.96	0.45	20	2.25	7.0686	51.0288	0.024	978.745	976.53	1.15	1.065	0.02663	1.31	93.57913	13.239	1.362	51.029
31.01.01	NATIONAL AVE	24	24	24	CMP	57	1001.9	1000.04	0.032632	21.3824	19.2	9	0.96	0.45	20	2	3.1416	21.3824	0.024	1004.9	1002	0.75	2.11	0.03702	1	37.42495	11.913	1.1028	21.382
32.04.06	COLLEGE	60	60	60	RCP	100	827.11	827.09	0.000200	211.303	308	184	3.52	2.16	330	5	19.635	211.303	0.013	834.61	832.09	2.11	0.41	0.0041	1.842	264.7224	13.482	1.4126	211.3
32.04.07	COLLEGE	60	60	60	RCP	100	827.17	826.96	0.002100	211.303	308	184	3.52	2.16	330	5	19.635	211.303	0.013	834.67	831.96	2.25	0.46	0.0046	1.842	280.3998	14.281	1.5848	211.3

Exhibit C - 4
Culvert Analysis Database
City of New Berlin

NEW BERLIN CULVERT ANALYSIS (greater than 18 inch diameter)

CULVERT ID	Location	Size (in)	Equiv. Diam. (in)	Height (in)	Mat'l Type	Length (ft)	U/S Invert (ft)	D/S Invert (ft)	Slope (ft/ft)	Cap. (cfs)	100 yr (cfs)	10 yr (cfs)	100 Yr Rate	10 yr Rate	Con-tributing Acres	IC Head (ft)	IC Area (ft^2)	IC Flow (cfs)	Manning 'n'	HW Elev. (ft)	TW Elev. (ft)	Entr loss K	Head (ft)	Friction Slope	R^2/3	Velocity (ft/s)	BC Flow (ft/s)	Entr loss (ft)	Cap. (cfs)
32.01.10	RACINE	24	24	24	RCP	244	864.67	862.2	0.010123	21.3824	41.2	23.2	2.06	1.16	20	2	3.1416	21.3824	0.013	867.67	864.2	0.89	2.58	0.01057	1	36.92668	11.754	1.0737	21.382
32.01.11	RACINE & JULIUS	24	24	24	RCP	66	863.25	862.43	0.012424	21.3824	61.8	34.8	2.06	1.16	30	2	3.1416	21.3824	0.013	866.25	864.43	1.25	0.57	0.00864	1	33.37266	10.623	0.8769	21.382
32.01.12	RACINE & JULIUS	24	24	24	RCP	70	862	861.49	0.007286	21.3824	103	58	2.06	1.16	50	2	3.1416	21.3824	0.013	865	863.49	0.87	0.64	0.00914	1	34.33731	10.93	0.9284	21.382
32.01.13	RACINE & JULIUS	24	24	24	RCP	151	861.91	860.02	0.012517	21.3824	20.6	11.6	2.06	1.16	10	2	3.1416	21.3824	0.013	864.91	862.02	1.12	1.77	0.01172	1	38.87975	12.376	1.1902	21.382
32.03.03	I-43 & RACINE	30	30	30	RCP	137	846.77	846.32	0.003285	37.3535	61.2	23.2	3.06	1.16	20	2.5	4.9087	37.3535	0.013	850.52	848.82	0.85	0.85	0.0062	1.16	51.28629	10.448	0.8483	37.354
32.03.02	I-43	54	54	54	RCP	417	890.08	880.53	0.022902	162.373	206	116	2.06	1.16	100	4.5	15.904	162.373	0.013	896.83	885.03	3.21	8.59	0.0206	1.717	448.0303	28.17	6.167	162.37
32.03.01	I-43	30	30	30	RCP	165	842.34	841.41	0.005636	37.3535	41.2	23.2	2.06	1.16	20	2.5	4.9087	37.3535	0.013	846.09	843.91	0.75	1.43	0.00867	1.16	60.61472	12.348	1.185	37.354
32.03.04	I-43	60X84	72	60	CONC	200	842.2	841.4	0.004000	304.277	412	232	2.06	1.16	200	5	28.274	304.277	0.013	849.7	846.4	2.25	1.05	0.00525	2.08	487.1116	17.228	2.3065	304.28
32.03.05	I-43	60X180	120	60	CONC	512	838.13	829.03	0.017773	845.214	412	232	2.06	1.16	200	5	78.54	845.214	0.013	845.63	834.03	2.25	9.35	0.01826	2.924	3547.451	45.168	15.854	845.21
32.03.06	I-43	60X180	120	60	CONC	346	847.13	841.1	0.017428	845.214	412	232	2.06	1.16	200	5	78.54	845.214	0.013	854.63	846.1	2.25	6.28	0.01815	2.924	3536.611	45.03	15.757	845.21
32.01.14	RACINE	24	24	24	CMP	54	875.15	873.36	0.033148	21.3824	20.6	11.6	2.06	1.16	10	2	3.1416	21.3824	0.024	878.15	875.36	0.97	1.82	0.0337	1	35.71053	11.367	1.0041	21.382
33.02.06	SUMMIT & DALE DRIVE	21X28	24	21	ACMP	40	828.9	827.87	0.025750	20.0014	21.8	12.4	1.09	0.62	20	1.75	3.1416	20.0014	0.024	831.525	829.62	0.75	1.155	0.02887	1	33.05357	10.521	0.8603	20.001
33.02.05	MARTIN	36	36	36	CMP	33	822.69	822.67	0.000606	58.923	80.37	48.41	1.16	0.62	80	3	7.0686	58.923	0.024	827.19	825.67	0.75	0.77	0.02333	1.31	87.60373	12.393	1.1936	58.923
33.03.05	MARTIN	36	36	36	CMP	33	822.74	822.69	0.001515	58.923	90.63	54.59	1.16	0.62	80	3	7.0686	58.923	0.024	827.24	825.69	0.75	0.8	0.02424	1.31	89.29399	12.633	1.2401	58.923
33.03.08	ROCK I-43 FREEWAY	72X120	96	72	CONC	250	824.1	823.5	0.002400	592.567	444	235	1.16	0.62	80	6	50.265	592.567	0.013	833.1	829.5	1.75	1.85	0.0074	2.52	1245.474	24.778	4.7711	592.57
33.03.07	ROCK I-43 FREEWAY	96X216	154	96	CONC	313	820.75	818.75	0.006390	1760.78	855	339	1.16	0.62	500	8	129.35	1760.78	0.013	832.75	826.75	2.75	3.25	0.01038	3.453	5202.599	40.221	12.572	1760.8
33.03.04	COLLEGE & SMALL	21X27	24	21	ACMP	49	835.51	834.48	0.021020	20.0014	19.2	10.8	0.96	0.54	20	1.75	3.1416	20.0014	0.024	838.135	836.23	0.72	1.185	0.02418	1	30.24953	9.6287	0.7205	20.001
33.03.03	COLLEGE	24	24	24	CCP	46	838.9	838.41	0.010652	21.3824	19.2	10.8	0.96	0.54	20	2	3.1416	21.3824	0.013	841.9	840.41	0.83	0.66	0.01435	1	43.01485	13.692	1.4569	21.382
33.01.02	CALHOUN & FREEWAY	24	24	24	CMP	56	844.43	843.96	0.008393	21.3824	34.8	18.6	1.16	0.62	30	2	3.1416	21.3824	0.024	847.43	845.96	0.51	0.96	0.01714	1	25.46825	8.1068	0.5107	21.382
33.01.01	CALHOUN & FREEWAY	24	24	24	CMP	54	844.7	843.61	0.020185	21.3824	34.8	18.6	1.16	0.62	30	2	3.1416	21.3824	0.024	847.7	845.61	0.64	1.45	0.02685	1	31.87459	10.146	0.8	21.382
33.01.04	COLLEGE, NB/MUSKEGO BORDER	24	24	24	ACMP	24	819.78	819.32	0.019167	21.3824	23.2	12.4	1.16	0.62	20	2	3.1416	21.3824	0.024	822.78	821.32	0.84	0.62	0.02583	1	31.26422	9.9517	0.7696	21.382
33.01.05	COLLEGE, NB/MUSKEGO BORDER	24	24	24	CMP	45	820.8	819.78	0.022667	21.3824	23.2	12.4	1.16	0.62	20	2	3.1416	21.3824	0.024	823.8	821.78	0.75	1.27	0.02822	1	32.67782	10.402	0.8408	21.382
33.01.06	ROCK I-43 FREEWAY	96X144	122	96	CONC	50	822.74	822.69	0.001000	1105.05	2900	1550	1.16	0.62	2500	8	81.18	1105.05	0.013	834.74	830.69	1.75	2.3	0.046	2.956	5883.928	72.48	40.825	1105.1
34.03.03	COLLEGE AVE, 2501500E, 344500N	18X24	21	18	ACMP	36	878.01	877.03	0.027222	14.1776	44	15.2	2.2	0.76	20	1.5	2.4053	14.1776	0.024	880.26	878.53	0.68	1.05	0.02917	0.915	23.26782	9.6736	0.7272	14.178
34.03.02	COLLEGE AVE, 2503500E, 344500N	20X28	24	20	ACMP	38	848.69	848.41	0.007368	19.5194	44	15.2	2.2	0.76	20	1.6667	3.1416	19.5194	0.024	851.19	850.08	0.46	0.653	0.01719	1	25.50545	8.1186	0.5122	19.519
34.02.06	SMALL	24X32	28	24	ACMP	40	886.51	886.33	0.004500	29.1038	23.2	12.4	1.16	0.62	20	2	4.2761	29.1038	0.024	889.51	888.33	0.53	0.65	0.01625	1.108	37.40321	8.7471	0.5946	29.104
34.02.09	I-43	42	42	42	RCP	188	897.56	895.42	0.011383	86.6267	49	15	1.16	0.62	20	3.5	9.6211	86.6267	0.013	902.81	898.92	1.24	2.65	0.0141	1.452	189.6142	19.708	3.0184	86.627
34.02.10	I-43	42	42	42	RCP	152	881.55	855.07	0.174211	86.6267	49	15	1.16	0.62	40	3.5	9.6211	86.6267	0.013	886.8	858.57	5.25	22.98	0.15118	1.452	620.9835	64.544	32.374	86.627
34.02.11	I-43	30	30	30	RCP	160	869.22	855.07	0.088437	37.3535	46.4	24.8	1.16	0.62	40	2.5	4.9087	37.3535	0.013	872.97	857.57	8.98	6.42	0.04012	1.16	130.4246	26.57	5.4862	37.354
34.01.01	SMALL & PUEBLO	30	30	30	RCP	105	886.51	886.33	0.001714	32.6521	34.8	18.6	1.16	0.62	30	2.5	4.9087	37.3535	0.024	890.26	888.83	0.53	0.9	0.00857	1.16	32.65207	6.6518	0.3439	32.652
34.01.02	SMALL	36	36	36	RCP	12	865.27	864.94	0.027500	58.923	34.8	18.6	1.16	0.62	30	3	7.0686	58.923	0.024	869.77	867.94	1.53	0.3	0.025	1.31	90.67847	12.828	1.2789	58.923
35.02.01	COLLEGE AVE	18X30	24	18	ACMP	35	836.4	833.88	0.072000	18.5177	29	14	0.58	0.28	50	1.5	3.1416	18.5177	0.024	838.65	835.38	1.25	2.02	0.05771	1	46.73036	14.875	1.7194	18.518
35.04.02	SUNNY SLOPE & TRIBUTARY	24X36	30	24	ACMP	37	822.7	822.62	0.002162	33.41	46.4	22.4	0.58	0.28	80	2	4.9087	33.41	0.024	825.7	824.62	0.48	0.6	0.01622	1.16	44.91164	9.1493	0.6505	33.41
35.04.03	GRANGE	27X42	36	27	ACMP	40	899.71	898.11	0.040000	51.0288	23.2	11.2	0.58	0.28	40	2.25	7.0686	51.0288	0.024	903.085	900.36	1.25	1.45	0.03688	1.41	110.1286	15.58	1.8864	51.029
36.01.10	FRANCES	24	24	24	CMP	43	812.83	811.75	0.025116	21.3824	41	15.4	4.1	1.54	10	2	3.1416	21.3824	0.024	815.83	813.75	0.85	1.23	0.0286	1	32.89848	10.472	0.8522	21.382
36.01.07	FRANCES & ST. MARY'S	36X132	74	36	CONC	41	805.13	805.03	0.002439	248.968	1476	554.4	4.1	1.54	360	3	29.867	248.968	0.013	809.63	808.03	1.12	0.48	0.01171	2.118	782.544	26.201	5.3349	248.97
36.01.06	FRANCES & ST. MARY'S	36X132	74	36	CONC	41	805.2	805.03	0.004146	248.968	1476	554.4	4.1	1.54	360	3	29.867	248.968	0.013	809.7	808.03	1.13	0.54	0.01317	2.118	800.0133	27.79	6.0017	248.97
36.01.05	FRANCES	24X36	31	24	ACMP	32	808.8	805.52	0.102500	35.6745	34	25	4.1	1.54	100	2	5.2414	35.6745	0.024	811.8	807.52	2.1	2.18	0.06812	1.186	100.4643	19.167	2.855	35.674
36.02.01	SUNNY SLOPE & GRANGE	18X30	24	18	ARCP	50	875.55	875.03	0.010400	18.5177	31.6	11.4	1.58	0.57	20	1.5	3.1416	18.5177	0.013	877.8	876.53	0.5	0.77	0.0154	1	44.56416	14.185	1.5637	18.518
36.02.02	SUNNY SLOPE & GRANGE	19X45	30	19	ARCP	55	875.41	874.49	0.016727	29.7268	47.4	17.1	1.58	0.57	30	1.5833	4.9087	29.7268	0.013	877.785	876.07	0.5	1.212	0.02203	1.16	96.6412			

2 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	Future Depth	Future Elevation Increase
Tributary A										
City Limit	234	224	RA0000	0	753.80	756.75	2.95	756.93	3.13	0.18
124th Street (5' 92"x3.92' Arch)	261	251	RA0040	40	753.90	757.93	4.03	758.25	4.35	0.32
RA1800L	318	297	RA1800	1,800	766.50	773.75	7.25	773.96	7.46	0.21
RA3530L	135	147	RA3530	3,530	779.00	785.27	6.27	785.46	6.46	0.19
RA5535L	153	165	RA5535	5,535	797.30	803.97	6.67	804.09	6.79	0.12
Tributary B										
City Limit	166	228	RB0000	0	742.30	745.08	2.78	745.54	3.24	0.46
124th Street (3' 9"x5' Box)	171	228	RB0030	30	742.45	745.09	2.64	745.56	3.11	0.47
RB0840L	169	228	RB0840	840	746.74	750.36	3.62	750.57	3.83	0.21
Lagoon Road (2' 7' 92"x5' 58' Arch)	166	228	RB0922	922	747.83	750.41	2.58	750.66	2.83	0.25
RB1932L	151	216	RB1932	1932	754.38	756.53	2.15	756.96	2.58	0.43
Cleveland Avenue (12.67"x8.08' Arc	152	216	RB2022	2022	754.75	757.14	2.39	757.64	2.89	0.50
RB2177L	147	212	RB2177	2177	756.25	758.45	2.20	758.81	2.56	0.36
Tributary BA										
128th Street (5' RCP)	86	130	RBA0040	40	756.43	759.42	2.99	760.16	3.73	0.74
RBA0790L	81	124	RBA0790	790	763.90	765.46	1.56	765.85	1.95	0.39
130th Street (2' 5' RCP)	80	124	RBA0828	828	764.10	766.11	2.01	766.59	2.49	0.48
RBA1773L	86	129	RBA1773	1773	774.14	775.16	1.02	775.26	1.12	0.10
132nd Street (2' 4' RCP)	86	130	RBA1823	1823	774.39	777.11	2.72	777.87	3.48	0.76
RBA2268L	91	130	RBA2268	2268	777.54	779.20	1.66	779.52	1.98	0.32
133rd Street (2' 4' RCP)	92	130	RBA2318	2318	778.61	780.54	1.93	780.98	2.37	0.44
RBA2423L	34	42	RBA2423	2423	779.67	780.59	0.92	780.99	1.32	0.40
Dakota Street (2' 4' RCP)	34	42	RBA2470	2470	780.45	781.73	1.28	781.75	1.30	0.02
RBA5230L	20	25	RBA5230	5230	820.17	820.79	0.62	820.89	0.72	0.10
Sunny Slope Road (5' RCP)	22	27	RBA5269	5269	820.54	822.27	1.73	822.46	1.92	0.19
RBA6779L	19	20	RBA6779	6779	845.28	845.77	0.49	845.79	0.51	0.02
Dakota Street (2' 3' RCP)	22	24	RBA6821	6821	846.10	847.39	1.29	847.42	1.32	0.03
Tributary BB										
RB00280L	62	83	RB00280	280	758.84	760.50	1.66	760.70	1.86	0.20
128th Street South (4' RCP)	62	83	RB00335	335	759.45	762.38	2.93	763.04	3.59	0.66
RB02565L	54	90	RB02565	2565	782.06	784.05	1.99	784.58	2.52	0.53
130th Street (4' RCP)	59	93	RB02600	2600	782.41	785.19	2.78	786.04	3.63	0.85
RB02855L	72	116	RB02855	2855	785.00	785.79	0.79	786.09	1.09	0.30
National Avenue (4' RCP)	73	118	RB02998	2998	787.27	793.67	6.40	797.39	10.12	3.72
Tributary C										
City Limit	63	87	RC0000	0	793.67	794.67	1.00	794.80	1.13	0.13

2 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase	Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth	
124th Street (4' RCP)	63	RC0040	40	793.80	797.15	3.35	798.06	4.26	24
RC1315L	44	RC1315	1315	806.00	806.87	0.87	807.13	1.13	24
Tributary D									
City Limit	22	RD0000	0	793.69	794.30	0.61	794.37	0.68	6
124th Street (6'x5.75' Box)	22	RD0068	68	794.57	795.08	0.51	795.16	0.59	6
RD1053L	11	RD1053	1053	809.00	809.29	0.29	809.33	0.33	4
Scarborough Drive (4.5' RCP)	13	RD1123	1123	811.00	812.30	1.30	812.34	1.34	2
RD1303L	13	RD1303	1303	816.72	816.98	0.26	816.99	0.27	2
Weatherstone Boulevard	14	RD1373	1373	819.39	819.94	0.55	819.96	0.57	1
(4.75'x3.17' Arch/5.33'x3.58 Arch)									
RD2073L	1	RD2073	2073	846.11	846.18	0.07	846.26	0.15	4
Victoria Circle	2	RD2154	2154	846.15	846.53	0.38	846.80	0.65	4
(4.75'x3.17' Arch/5.33'x3.58 Arch)									
RD2639L	4	RD2639	2639	852.83	852.99	0.16	853.11	0.28	7
Coldspring Road (6.08'x4.58' Arch)	3	RD2674	2674	853.44	853.96	0.52	854.27	0.83	6
Tributary E									
City Limit	82	RE0000	0	805.00	806.67	1.67	806.79	1.79	30
RE0235L	84	RE0235	235	805.20	807.18	1.98	807.36	2.16	29
RE0425L	85	RE0425	425	805.30	807.40	2.10	807.57	2.27	21
St. Mary's Drive	86	RE0466	466	805.40	807.41	2.01	807.57	2.17	20
(2.11'x3' Box)									
RE1576L	90	RE1576	1576	813.94	814.95	1.01	815.02	1.08	17
Grange Avenue (4' RCP)	90	RE1616	1616	814.26	817.98	3.72	818.67	4.41	16
RE3766L	70	RE3766	3766	831.32	832.50	1.18	832.66	1.34	16
Marquette Drive	72	RE3806	3806	832.27	833.18	0.91	833.30	1.03	15
(3.475'x3.17' Arch)									
RE4476L	65	RE4476	4476	838.09	840.04	1.95	840.34	2.25	17
Balboa Drive	66	RE4520	4520	838.60	840.20	1.60	840.54	1.94	16
(2.475'x3.17' Arch)									
RE4950L	65	RE4950	4950	841.04	842.11	1.07	842.24	1.20	18
Cherrytree Road	64	RE4999	4999	841.41	843.02	1.61	843.32	1.91	20
(2.475'x3.17' Arch)									
RE5869L	67	RE5869	5869	845.96	847.05	1.09	847.21	1.25	26
Radisson Court	70	RE5914	5914	846.10	847.87	1.77	848.23	2.13	24
(2.475'x3.17' Arch)									
RE6914L	46	RE6914	6914	851.99	852.84	0.85	853.11	1.12	27
Marin Way	48	RE7389	7389	856.52	858.10	1.58	858.44	1.92	28
(2.567'x3.58' Elliptical)									
Beloit Road	24	RE7474	7474	857.33	858.10	0.77	858.43	1.10	24
(2.7'x3' Box)									
RE7594L	25	RE7594	7594	857.49	858.14	0.65	858.46	0.97	24
INTR43 (5'x5' Box)	25	RE7928	7928	857.59	859.18	1.59	859.96	2.37	26
Tributary F									
Frances Street (2.92'x2' Arch)	9	RF0167	167	805.40	807.20	1.80	807.49	2.09	6

City of New Berlin
Root River

10 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	
Tributary A								
City Limit	283	RA0000	0	753.80	757.53	3.73	757.79	35
124th Street (5.92'x3.92' Arch)	275	RA0040	40	753.90	759.68	5.78	760.80	4
124th Street Overflow	9							
RA1800L	337	RA1800	1,800	766.50	774.57	8.07	774.73	(44)
RA3530L	201	RA3530	3,530	779.00	786.25	7.25	786.45	18
RA5535L	237	RA5535	5,535	797.30	804.76	7.46	804.85	17
Tributary B								
City Limit	272	RB0000	0	742.30	745.83	3.53	746.30	89
124th Street (3 9'x5' Box)	273	RB0030	30	742.45	745.85	3.40	746.32	144
RB0840L	272	RB0840	840	746.74	750.69	3.95	750.91	226
Lagoon Road (2 7 92'x5 58' Arch)	272	RB0922	922	747.83	750.83	3.00	751.12	88
RB1932L	248	RB1932	1932	754.38	757.15	2.77	757.55	88
Cleveland Avenue (12.67'x8.08' Arc	248	RB2022	2022	754.75	757.86	3.11	758.35	88
RB2177L	239	RB2177	2177	756.25	758.92	2.67	759.24	88
Tributary BA								
128th Street (5' RCP)	154	RBA0040	40	756.13	760.61	4.18	761.83	66
RBA0790L	139	RBA0790	790	763.90	765.97	2.07	766.39	67
130th Street (2 5' RCP)	140	RBA0828	828	764.10	766.74	2.64	767.29	66
RBA1773L	141	RBA1773	1773	774.14	775.31	1.17	775.49	69
132nd Street (2 4' RCP)	142	RBA1823	1823	774.39	778.17	3.78	780.48	68
RBA2268L	143	RBA2268	2268	777.54	779.69	2.15	780.53	71
133rd Street (2 4' RCP)	144	RBA2318	2318	778.61	781.24	2.63	781.97	70
RBA2423L	71	RBA2423	2423	779.67	781.27	1.60	781.99	20
Dakota Street (2 4' RCP)	72	RBA2470	2470	780.45	782.19	1.74	782.29	18
RBA5230L	42	RBA5230	5230	820.17	821.07	0.90	821.13	6
Sunny Slope Road (5' RCP)	42	RBA5269	5269	820.54	822.77	2.23	822.98	6
RBA6779L	30	RBA6779	6779	845.28	845.93	0.65	845.95	2
Dakota Street (2 3' RCP)	32	RBA6821	6821	846.10	847.65	1.55	847.69	2
Tributary BB								
RBB0280L	86	RBB0280	280	758.84	760.71	1.87	760.87	24
128th Street South (4' RCP)	86	RBB0335	335	759.45	763.09	3.64	764.00	24
RBB2565L	81	RBB2565	2565	782.06	784.48	2.42	785.03	46
130th Street (4' RCP)	87	RBB2600	2600	782.41	785.97	3.56	787.31	45
RBB2855L	106	RBB2855	2855	785.00	786.02	1.02	787.33	51
National Avenue (4' RCP)	109	RBB2998	2998	787.27	797.31	10.04	797.68	56
National Avenue Overflow	0	RBB2998	2998	797.00	797.31	0.31	797.68	22

City of New Berlin
Root River
10 Year/3 Hour Precipitation Event

Conduit			Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase	
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation		Future Depth
Tributary C										
City Limit	94	121	RC0000	0	793.67	794.83	1.16	794.99	1.32	27
124th Street (4' RCP)	94	121	RC0040	40	793.80	798.35	4.55	799.89	6.09	27
RC1315L	69	109	RC1315	1315	806.00	807.13	1.13	807.49	1.49	40
Tributary D										
City Limit	40	50	RD0000	0	793.69	794.49	0.80	794.59	0.90	10
124th Street (6'x5.75' Box)	40	50	RD0068	68	794.57	795.30	0.73	795.43	0.86	10
RD1053L	19	24	RD1053	1053	809.00	809.39	0.39	809.45	0.45	5
Scarborough Drive (4.5' RCP)	22	25	RD1123	1123	811.00	812.68	1.68	812.76	1.76	3
RD1303L	23	25	RD1303	1303	816.72	817.07	0.35	817.08	0.36	2
Weatherstone Boulevard	23	25	RD1373	1373	819.39	820.09	0.70	820.12	0.73	2
(4.75'x3.17' Arch/5.33'x3.58 Arch)										
RD2073L	6	9	RD2073	2073	846.11	846.27	0.16	846.32	0.21	3
Victoria Circle	6	10	RD2154	2154	846.15	846.81	0.66	846.98	0.83	4
(4.75'x3.17' Arch/5.33'x3.58 Arch)										
RD2639L	6	15	RD2639	2639	852.83	853.03	0.20	853.18	0.35	9
Coldspring Road (6.08'x4.58' Arch)	6	13	RD2674	2674	853.44	854.13	0.69	854.43	0.99	7
Tributary E										
City Limit	165	197	RE0000	0	805.00	807.03	2.03	807.24	2.24	32
RE0235L	165	198	RE0235	235	805.20	807.69	2.49	807.96	2.76	33
RE0425L	154	179	RE0425	425	805.30	807.90	2.60	808.21	2.91	25
St. Mary's Drive	154	180	RE0466	466	805.40	807.91	2.51	808.22	2.82	26
(2.11'x3' Box)										
RE1576L	149	174	RE1576	1576	813.94	815.20	1.26	815.39	1.45	25
Grange Avenue (4' RCP)	150	174	RE1616	1616	814.26	820.74	6.48	821.50	7.24	24
RE3766L	108	131	RE3766	3766	831.32	832.82	1.50	833.00	1.68	23
Marquette Drive	108	132	RE3806	3806	832.27	833.43	1.16	833.59	1.32	24
(3.4.75'x3.17' Arch)										
RE4476L	93	117	RE4476	4476	838.09	840.43	2.34	840.73	2.64	24
Balboa Drive	92	118	RE4520	4520	838.60	840.67	2.07	841.04	2.44	26
(2.4.75'x3.17' Arch)										
RE4950L	92	118	RE4950	4950	841.04	842.28	1.24	842.41	1.37	26
Cherrytree Road	92	118	RE4999	4999	841.41	843.43	2.02	843.78	2.37	26
(2.4.75'x3.17' Arch)										
RE5869L	101	136	RE5869	5869	845.96	847.26	1.30	847.43	1.47	35
Radisson Court	102	138	RE5914	5914	846.10	848.36	2.26	848.85	2.75	36
(2.4.75'x3.17' Arch)										
RE6914L	70	112	RE6914	6914	851.99	853.08	1.09	853.45	1.46	42
Marin Way	72	118	RE7389	7389	856.52	858.41	1.89	858.87	2.35	46
(2.5.67'x3.58' Elliptical)										
Beloit Road	36	72	RE7474	7474	857.33	858.41	1.08	858.86	1.53	36
(2.7'x3' Box)										
RE7594L	36	73	RE7594	7594	857.49	858.43	0.94	858.88	1.39	37
INTR43 (5'x5' Box)	37	79	RE7928	7928	857.59	859.52	1.93	860.60	3.01	42

City of New Berlin
Root River

10 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)		
Tributary F Frances Street (2.92'x2' Arch)	21	27	RF0167	167	805.40	808.16	2.76	0.54	6
						808.70	3.30		

City of New Berlin
Root River

25 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	
Tributary A								
City Limit	398	RA0000	0	753.80	758.07	4.27	758.28	0.21
124th Street (5.92'x3.92' Arch)	396	RA0040	40	753.90	763.11	9.21	763.30	0.19
124th Street Overflow	2	RA0040	40	762.00	763.11	1.11	763.31	0.20
RA1800L	386	RA1800	1,800	766.50	774.24	7.74	774.51	0.27
RA3530L	250	RA3530	3,530	779.00	786.85	7.85	787.04	0.19
RA5535L	316	RA5535	5,535	797.30	804.84	7.54	804.91	0.07
Tributary B								
City Limit	377	RB0000	0	742.30	746.40	4.10	746.72	0.32
124th Street (3 9'x5' Box)	378	RB0030	30	742.45	746.54	4.09	746.86	0.32
RB0840L	378	RB0840	840	746.74	750.92	4.18	751.08	0.16
Lagoon Road (2 7.92'x5.58' Arch)	378	RB0922	922	747.83	751.60	3.77	751.92	0.32
RB1932L	344	RB1932	1932	754.38	757.61	3.23	757.89	0.28
Cleveland Avenue (12.67'x8.08' Arc	344	RB2022	2022	754.75	759.27	4.52	759.71	0.44
RB2177L	333	RB2177	2177	756.25	759.54	3.29	759.90	0.36
Tributary BA								
128th Street (2 @ 5' RCP)	228	RBA0040	40	756.43	760.57	4.14	761.11	0.54
RBA0790L	208	RBA0790	790	763.90	766.40	2.50	766.73	0.33
130th Street (2 5' RCP)	208	RBA0828	828	764.10	767.41	3.31	767.86	0.45
RBA1773L	210	RBA1773	1773	774.14	775.50	1.36	775.64	0.14
132nd Street (2 4' RCP)	2,100	RBA1823	1823	774.39	778.99	4.60	780.49	1.50
RBA2268L	211	RBA2268	2268	777.54	780.01	2.47	780.61	0.60
133rd Street (2 4' RCP)	211	RBA2318	2318	778.61	782.53	3.92	783.98	1.45
RBA2423L	115	RBA2423	2423	779.67	782.55	2.88	783.98	1.43
Dakota Street (2 4' RCP)	115	RBA2470	2470	780.45	783.21	2.76	784.56	1.35
RBA5230L	69	RBA5230	5230	820.17	821.30	1.13	821.50	0.20
Sunny Slope Road (5' RCP)	69	RBA5269	5269	820.54	823.55	3.01	823.70	0.15
RBA6779L	39	RBA6779	6779	845.28	846.04	0.76	846.07	0.03
Dakota Street (2 3' RCP)	42	RBA6821	6821	846.10	847.73	1.63	847.74	0.01
Tributary BB								
RB00280L	107	RBB0280	280	758.84	760.85	2.01	761.01	0.16
128th Street South (4' RCP)	107	RBB0335	335	759.45	763.90	4.45	764.76	0.86
RBB2565L	110	RBB2565	2565	782.06	784.69	2.63	785.20	0.51
130th Street (4' RCP)	120	RBB2600	2600	782.41	786.45	4.04	788.28	1.83
RBB2855L	130	RBB2855	2855	785.00	786.48	1.48	788.30	1.82
National Avenue (4' RCP)	116	RBB2998	2998	787.27	797.48	10.21	797.81	0.33
National Avenue Overflow	28	RBB2998	2998	797.00	797.48	0.48	797.81	0.33

City of New Berlin
Root River
25 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions					
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth	Future Elevation Increase	Future Flow Increase
INTR43 (5'x5' Box)	46	101	RE7928	7928	857.59	860.01	2.42	861.41	3.82	1.40	55
Tributary F											
Frances Street (2.92'x2' Arch)	30	31	RF0167	167	805.40	809.35	3.95	809.63	4.23	0.28	1
Frances Street Overflow	1	13	RF0167	167	809.18	809.32	0.14	809.63	0.45	0.31	12

City of New Berlin
Root River

100 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	
Tributary A								
City Limit	648	RA0000	0	753.80	759.27	759.55	759.49	47
124th Street (5.92'x3.92' Arch)	413	RA0040	40	753.90	764.13	764.35	763.82	1
124th Street Overflow	237	RA0040	40	762.00	764.13	764.35	763.82	49
RA1800L	547	RA1800	1,800	766.50	775.16	775.35	775.27	46
RA3530L	349	RA3530	3,530	779.00	787.77	788.42	788.08	33
RA5535L	503	RA5535	5,535	797.30	805.09	805.95	805.48	43
Tributary B								
City Limit	583	RB0000	0	742.30	747.24	4.94	747.66	109
124th Street (3' 9"x5' Box)	582	RB0030	30	742.45	747.53	5.08	748.04	111
RB0840L	585	RB0840	840	746.74	751.34	4.60	751.58	112
Lagoon Road (2' 7.92"x5.58" Arch)	584	RB0922	922	747.83	752.54	4.71	753.15	114
RB1932L	526	RB1932	1932	754.38	758.23	3.85	758.55	105
Cleveland Avenue (12.67'x8.08' Arc	527	RB2022	2022	754.75	760.27	5.52	760.86	104
RB2177L	510	RB2177	2177	756.25	760.40	4.15	760.94	102
Tributary BA								
128th Street (5' RCP)	354	RBA0040	40	756.43	762.02	5.59	763.45	80
RBA0790L	330	RBA0790	790	763.90	767.04	3.14	767.30	75
130th Street (2' 5' RCP)	330	RBA0828	828	764.10	768.39	4.29	768.95	78
RBA1773L	334	RBA1773	1773	774.14	775.82	1.68	775.97	0
132nd Street (2' 4' RCP)	316	RBA1823	1823	774.39	781.94	7.55	782.45	(316)
132nd Street Overflow	17	RBA1823	1823	781.50	782.11	0.61	782.45	397
RBA2268L	337	RBA2268	2268	777.54	781.99	4.45	782.49	#REF!
133rd Street (2' 4' RCP)	290	RBA2318	2318	778.61	784.90	6.29	785.33	12
133rd Street Overflow	71	RBA2318	2318	784.00	784.90	0.90	785.33	79
RBA2423L	182	RBA2423	2423	779.67	784.91	5.24	785.34	22
Dakota Street (2' 4' RCP)	181	RBA2470	2470	780.45	786.14	5.69	786.82	23
RBA5230L	123	RBA5230	5230	820.17	821.69	1.52	821.75	9
Sunny Slope Road (5' RCP)	124	RBA5269	5269	820.54	824.70	4.16	824.86	8
RBA6779L	62	RBA6779	6779	845.28	846.29	1.01	846.31	2
Dakota Street (2' 3' RCP)	64	RBA6821	6821	846.10	848.23	2.13	848.31	4
Tributary BB								
RBB0280L	142	RBB0280	280	758.84	761.12	2.28	761.28	22
128th Street South (4' RCP)	142	RBB0335	335	759.45	765.35	5.90	766.14	20
128th Street South Overflow	0	RBB0335	335	766.00	765.35	-0.65	766.14	1
RBB2565L	167	RBB2565	2565	782.06	785.14	3.08	785.56	99
130th Street (4' RCP)	168	RBB2600	2600	782.41	787.64	5.23	789.41	71

25 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Elevation Increase
Tributary C								
City Limit	108	RC0000	0	793.67	794.99	1.32	795.28	0.29
124th Street (4' RCP)	108	RC0040	40	793.80	799.86	6.06	801.09	1.23
124th Street Overflow	0	RC0040	40	800.82	799.86	-0.96	801.09	1.23
RC1315L	86	RC1315	1315	806.00	807.30	1.30	807.72	0.42
Tributary D								
City Limit	68	RD0000	0	793.69	794.72	1.03	794.80	0.08
124th Street (6'x5.75' Box)	68	RD0068	68	794.57	795.60	1.03	795.80	0.20
RD1053L	34	RD1053	1053	809.00	809.55	0.55	809.60	0.05
Scarborough Drive (4.5' RCP)	34	RD1123	1123	811.00	813.05	2.05	813.21	0.16
RD1303L	34	RD1303	1303	816.72	817.16	0.44	817.20	0.04
Weatherstone Boulevard (4.75'x3.17' Arch/5.33'x3.58 Arch)	34	RD1373	1373	819.39	820.25	0.86	820.31	0.06
RD2073L	11	RD2073	2073	846.11	846.34	0.23	846.39	0.05
Victoria Circle (4.75'x3.17' Arch/5.33'x3.58 Arch)	11	RD2154	2154	846.15	847.01	0.86	847.15	0.14
RD2639L	11	RD2639	2639	852.83	853.10	0.27	853.22	0.12
Coldspring Road (6.08'x4.58' Arch)	11	RD2674	2674	853.44	854.35	0.91	854.56	0.21
Tributary E								
City Limit	233	RE0000	0	805.00	807.60	2.60	807.74	0.14
RE0235L	233	RE0235	235	805.20	808.27	3.07	808.41	0.14
RE0425L	216	RE0425	425	805.30	808.55	3.25	808.68	0.13
St. Mary's Drive (2.11'x3' Box)	216	RE0466	466	805.40	808.71	3.31	808.87	0.16
RE1576L	208	RE1576	1576	813.94	815.59	1.65	815.67	0.08
Grange Avenue (4' RCP)	208	RE1616	1616	814.26	817.28	3.02	817.43	0.15
RE3766L	144	RE3766	3766	831.32	833.03	1.71	833.20	0.17
Marquette Drive (3.4.75'x3.17' Arch)	144	RE3806	3806	832.27	833.99	1.72	834.21	0.22
RE4476L	128	RE4476	4476	838.09	840.51	2.42	840.74	0.23
Balboa Drive (2.4.75'x3.17' Arch)	128	RE4520	4520	838.60	841.27	2.67	841.71	0.44
RE4950L	126	RE4950	4950	841.04	842.41	1.37	842.55	0.14
Cherrytree Road (2.4.75'x3.17' Arch)	126	RE4999	4999	841.41	844.07	2.66	844.51	0.44
RE5869L	126	RE5869	5869	845.96	847.35	1.39	847.55	0.20
Radisson Court (2.4.75'x3.17' Arch)	126	RE5914	5914	846.10	848.91	2.81	849.54	0.63
RE6914L	88	RE6914	6914	851.99	853.24	1.25	853.61	0.37
Marin Way (2.5.67'x3.58' Elliptical)	90	RE7389	7389	856.52	858.26	1.74	858.83	0.57
Beloit Road (2.7'x3' Box)	44	RE7474	7474	857.33	858.25	0.92	858.80	0.55
RE7594L	44	RE7594	7594	857.49	858.31	0.82	858.83	0.52

City of New Berlin
Root River
100 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	Future Depth	
130th Street Overflow	0	84	RBB2600	2600	788.50	787.64	-0.86	789.41	0.91	84
RBB2855L	185	338	RBB2855	2855	785.00	787.66	2.66	789.43	4.43	153
National Avenue (4' RCP)	168	206	RBB2998	2998	787.27	797.70	10.43	798.22	10.95	38
National Avenue Overflow	59	160	RBB2998	2998	797.00	797.70	0.70	798.22	1.22	101
Tributary C										
City Limit	213	287	RC0000	0	793.67	795.54	1.87	795.85	2.18	74
124th Street (4' RCP)	152	174	RC0040	40	793.80	801.28	7.48	801.49	7.69	22
124th Street Overflow	61	113	RC0040	40	800.82	801.28	0.46	801.49	0.67	52
RC1315L	124	202	RC1315	1315	806.00	807.60	1.60	808.15	2.15	78
Tributary D										
City Limit	127	142	RD0000	0	793.69	795.11	1.42	795.19	1.50	15
124th Street (6'x5.75' Box)	127	142	RD0068	68	794.57	796.62	2.05	796.84	2.27	15
RD1053L	66	73	RD1053	1053	809.00	809.82	0.82	809.87	0.87	7
Scarborough Drive (4.5' RCP)	66	73	RD1123	1123	811.00	813.96	2.96	814.15	3.15	7
RD1303L	66	73	RD1303	1303	816.72	817.37	0.65	817.41	0.69	7
Weatherstone Boulevard	66	73	RD1373	1373	819.39	820.62	1.23	820.69	1.30	7
(4.75'x3.17' Arch/5.33'x3.58 Arch)										
RD2073L	23	28	RD2073	2073	846.11	846.47	0.36	846.52	0.41	6
Victoria Circle	23	28	RD2154	2154	846.15	847.35	1.20	847.49	1.34	6
(4.75'x3.17' Arch/5.33'x3.58 Arch)										
RD2639L	23	29	RD2639	2639	852.83	853.25	0.42	853.31	0.48	6
Coldspring Road (6.08'x4.58' Arch)	23	29	RD2674	2674	853.44	854.74	1.30	854.88	1.44	6
Tributary E										
City Limit	384	448	RE0000	0	805.00	808.06	3.06	808.22	3.22	64
RE0235L	384	448	RE0235	235	805.20	808.80	3.60	808.99	3.79	64
RE0425L	319	320	RE0425	425	805.30	809.10	3.80	809.30	4.00	1
St. Mary's Drive	316	338	RE0466	466	805.40	809.43	4.03	809.69	4.29	22
(2.11'x3' Box)										
St. Mary's Drive Overflow	6	33	RE0466	466	809.27	809.43	0.16	809.69	0.42	27
RE1576L	312	363	RE1576	1576	813.94	815.93	1.99	816.06	2.12	51
Grange Avenue (4' X 6.33' RCP)	312	362	RE1616	1616	814.26	818.12	3.86	818.57	4.31	50
RE3766L	229	274	RE3766	3766	831.32	833.53	2.21	833.74	2.42	45
Marquette Drive	229	274	RE3806	3806	832.27	834.75	2.48	835.19	2.92	45
(3.4.75'x3.17' Arch)										
RE4476L	211	251	RE4476	4476	838.09	841.12	3.03	841.23	3.14	40
Balboa Drive	197	208	RE4520	4520	838.60	842.89	4.29	843.19	4.59	11
(2.4.75'x3.17' Arch)										
Balboa Drive Overflow	14	27	RE4520	4520	842.50	842.59	0.09	843.19	0.69	13
RE4950L	221	277	RE4950	4950	841.04	842.90	1.86	843.19	2.15	56
Cherrytree Road	191	195	RE4999	4999	841.41	845.09	3.68	845.43	4.02	4
(2.4.75'x3.17' Arch)										
Cherrytree Road Overflow	31	77	RE4999	4999	844.50	845.09	0.59	845.43	0.93	46
RE5869L	216	275	RE5869	5869	845.96	847.67	1.71	847.76	1.80	59
Radisson Court	200	216	RE5914	5914	846.10	850.41	4.31	850.80	4.70	16

City of New Berlin
Root River
100 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	
(2 4.75'x3.17' Arch)								
Radisson Court Overflow	16	59	RE5914	5914	850.00	850.41	0.41	43
RE6914L	136	198	RE6914	6914	851.99	853.58	1.59	62
Marin Way	137	202	RE7389	7389	856.52	858.73	2.21	65
(2 5.67'x3.58' Elliptical)								
Beloit Road	87	123	RE7474	7474	857.33	859.00	1.67	36
(2 7'x3' Box)								
RE7594L	87	129	RE7594	7594	857.49	858.74	1.25	42
I-43 (5'x5' Box)	87	148	RE7928	7928	857.59	861.09	3.50	61
Tributary F								
Frances Street (2.92'x2' Arch)	31	31	RF0167	167	803.40	809.89	4.49	0
Frances Street Overflow	42	56	RF0167	167	809.18	809.89	0.71	14
						809.97	4.57	0.08
						809.97	0.79	0.08

Conduit			Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase	
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	Future Depth	Future Elevation Increase
Mainstem										
Muskego Lake Inflow	109	181	C00000	0	804.00	806.58	2.58	807.25	3.25	0.67
College (2 - 5' RCP)	115	181	C00100	100	811.70	808.06	-3.64	808.91	-2.79	0.85
C00276L	142	262	C00276	276	805.00	808.06	3.06	808.94	3.94	0.88
C01161L	1	1	C01161	1,161	817.00	817.04	0.04	817.05	0.05	0.01
Rock Freeway (I-43) (18" RCP)	1	2	C01436	1,436	818.30	818.97	0.67	819.14	0.84	0.17
Tributary A										
CA0825L	143	161	CA0825	825	816.30	817.35	1.05	817.41	1.11	0.06
Racine Place (5' x 8' Box)	143	161	CA0853	853	816.35	819.81	3.46	820.06	3.71	
CA0984L	145	161	CA0984	984	819.50	820.25	0.75	820.29	0.79	0.04
CA2499L	62	103	CA2499	2,499	827.10	829.28	2.18	829.76	2.66	0.48
College Avenue (2 7.92'x5 58' Arch)	62	103	CA2599	2,599	827.20	829.44	2.24	829.99	2.79	0.55
CA3059L	61	100	CA3059	3059	828.80	830.46	1.66	830.95	2.15	0.49
CA3309L	61	100	CA3309	3309	829.10	831.09	1.99	831.61	2.51	0.52
Racine Drive (6' RCP)	61	100	CA3399	3399	829.20	832.48	3.28	833.35	4.15	0.87
CA6009L	54	104	CA6009	6009	837.29	838.25	0.96	838.63	1.34	0.38
Tans Drive (4' RCP)	65	116	CA6047	6047	837.49	841.07	3.58	843.49	6.00	2.42
Tributary C										
CC0675L	127	131	CC0675	675	828.00	830.02	2.02	830.05	2.05	0.03
CC1413L	127	131	CC1413	1413	842.00	843.12	1.12	843.13	1.13	0.01
Rock Freeway (I-43) (10'x7' Box)	127	131	CC1759	1759	848.90	850.27	1.37	850.29	1.39	0.02
Tributary B										
CB1130L	95	145	CB1130	1130	815.40	816.83	1.43	817.02	1.62	0.19
CB2388L	95	145	CB2388	2388	816.90	817.65	0.75	817.90	1.00	0.25
CB02533L	62	145	CB2533	2533	817.10	818.27	1.17	818.82	1.72	0.55
CB06368L	59	141	CB6368	6368	821.70	822.59	0.89	823.04	1.34	0.45
Rock Freeway (I-43) (18'x8' Box)	62	150	CB6623	6623	822.00	823.52	1.52	824.42	2.42	0.90
CB9798L	62	148	CB9798	9798	825.85	827.35	1.50	828.23	2.38	0.88
Beres Road (4' RCP)	62	104	CB9833	9833	825.95	829.49	3.54	831.31	5.36	0.88
Beres Road Overflow	0	45	CB9833	9833	830.60	829.49	-1.11	831.31	0.71	1.82
CB10673L	63	151	CB10673	10673	826.60	829.51	2.91	831.33	4.73	1.82
CB11448L	67	177	CB11448	11448	827.12	829.87	2.75	831.49	4.37	1.62
Calhoun Road (2 4' RCP)	67	184	CB11493	11493	827.44	830.03	2.59	832.41	4.97	2.38
CB11673	65	160	CB11673	11673	828.10	830.05	1.95	832.42	4.32	2.37
CB12046L	67	166	CB12046	12046	829.40	830.07	0.67	832.42	3.02	2.35
CB14488L	69	208	CB14488	14488	837.90	839.28	1.38	839.64	1.74	0.36
CB19675L	26	142	CB19675	19675	856.10	856.73	0.63	857.54	1.44	0.81
CB20972L	43	167	CB20972	20972	860.50	861.60	1.10	862.32	1.82	0.72
Rock Freeway (I-43) (2 5' RCP)	70	153	CB21112	21112	860.70	863.43	2.73	864.67	3.97	1.24
Tributary D										

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth		
CD0095L	10	15	CD0095	95	815.50	816.95	1.45	817.02	1.52	0.07	5
Rock Freeway (I-43) (8'x12' Box)	10	15	CD0290	290	815.80	816.72	0.92	817.02	1.22	0.30	5
Tributary E											
CE0070L	30	61	CE0070	70	817.30	818.27	0.97	818.82	1.52	0.55	31
Rock Freeway (I-43) (6'x10' Box)	30	61	CE0380	380	818.40	819.92	1.52	820.79	2.39	0.87	31
CE1688L	21	54	CE1688	1688	822.67	823.48	0.81	823.92	1.25	0.44	33
Martin Road	22	59	CE1728	1728	822.69	824.41	1.72	825.46	2.77	1.05	37
(2 3' RCP)											
Tributary F											
CF0510L	17	21	CF0510	510	831.10	831.47	0.37	831.52	0.42	0.05	4
CF2058L	20	24	CF2058	2058	844.70	843.34	-1.36	843.40	-1.30	0.06	4
Beloit Road (4' RCP)	22	26	CF2088	2088	843.05	845.05	2.00	845.20	2.15	0.15	4
CF3620L	17	17	CF3620	3620	865.00	865.76	0.76	865.83	0.83	0.07	0

City of New Berlin
Calhoun Creek

10 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	
Mainstem								
Muskego Lake Inflow	290	C00000	0	804.00	808.19	4.19	808.51	67
College (2 - 5' RCP)	290	C00100	100	804.80	810.67	5.87	812.24	67
C00276L	290	C00276	276	805.00	810.71	5.71	812.24	67
C01161L	5	C01161	1,161	817.00	817.12	0.12	817.12	0
Rock Freeway (1-43) (18" RCP)	5	C01436	1,436	818.30	820.67	2.37	820.78	1
Tributary A								
CA0825L	225	CA0825	825	816.30	817.56	1.26	817.66	49
Racine Place (5' x 8' Box)	220	CA0853	853	816.35	820.79		821.22	
CA0984L	229	CA0984	984	819.50	820.80	1.30	821.23	30
CA2409L	129	CA2499	2,499	827.10	830.07	2.97	830.50	46
College Avenue (2 7.92'x5.58' Arch)	131	CA2599	2,599	827.20	830.34	3.14	830.82	47
CA3059L	125	CA3059	3059	828.80	831.21	2.41	831.67	49
CA3309L	125	CA3309	3309	829.10	831.92	2.82	832.44	49
Racine Drive (6' RCP)	125	CA3399	3399	829.20	833.85	4.65	834.77	50
CA6009L	97	CA6009	6009	837.29	838.58	1.29	839.06	90
Tans Drive (4' RCP)	100	CA6047	6047	837.49	842.57	5.08	845.13	41
Tans Drive Overflow	0	CA6047	6047	844.10	842.57	-1.53	845.13	103
Tributary C								
CC0675L	219	CC0675	675	828.00	830.60	2.60	830.63	5
CC1413L	207	CC1413	1413	842.00	843.47	1.47	843.48	4
Rock Freeway (1-43) (10'x7' Box)	207	CC1759	1759	848.90	850.79	1.89	850.82	4
Tributary B								
CB1130L	201	CB1759	1130	815.40	817.28	1.88	817.57	119
CB2388L	201	CB1130	2388	816.90	818.06	1.16	818.29	123
CB02533L	201	CB2533	2533	817.10	819.11	2.01	819.56	113
CB06368L	187	CB6368	6368	821.70	823.22	1.52	823.54	100
Rock Freeway (1-43) (18'x8' Box)	191	CB6623	6623	822.00	824.79	2.79	825.50	102
CB9798L	192	CB9798	9798	825.85	828.59	2.74	829.09	105
Beres Road (4' RCP)	109	CB9833	9833	825.95	831.59	5.64	832.07	8
Beres Road Overflow	87	CB9833	9833	830.60	831.59	0.99	832.07	96
CB10673L	195	CB10673	10673	826.60	831.62	5.02	832.11	101
CB11448L	165	CB11448	11448	827.12	831.75	4.63	832.25	108
Calhoun Road (2 4' RCP)	170	CB11493	11493	827.44	832.70	5.26	834.81	104
Calhoun Road Overflow	0	CB11493	11494	834.60	832.70	-1.90	834.81	4
CB11673	157	CB11673	11673	828.10	832.71	4.61	834.81	93
CB12046L	161	CB12046	12046	829.40	832.71	3.31	834.81	90
CB14488L	217	CB14488	14488	837.90	839.68	1.78	840.13	135
CB19675L	64	CB19675	19675	856.10	857.06	0.96	857.88	168
CB20972L	70	CB20972	20972	860.50	861.84	1.34	862.70	193
Rock Freeway (1-43)	105	CB21112	21112	860.70	863.99	3.29	866.01	149

City of New Berlin
Calhoun Creek
10 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	
(2.5' RCP)								
Tributary D								
CD0095L	35	CD0095	95	815.50	817.28	1.78	817.57	5
Rock Freeway (1-43) (8'x12' Box)	34	CD0290	290	815.80	817.48	1.68	817.57	1
Tributary E								
CE0070L	63	CD0290	70	817.30	819.11	1.81	819.56	30
Rock Freeway (1-43) (6'x10' Box)	63	CE0070	380	818.40	820.82	2.42	821.52	31
CE1688L	43	CE0380	1688	822.67	823.79	1.12	824.21	45
Martin Road	44	CE0380	1728	822.69	825.03	2.34	826.59	46
(2.3' RCP)								
Tributary F								
CF0510L	37	CE1728	510	831.10	831.68	0.58	832.11	0
CF2058L	38	CE1728	2058	842.80	843.48	0.68	843.54	3
Beloit Road (4' RCP)	38	CF0510	2088	843.05	845.66	2.61	845.66	(2)
CF3620L	20	CF2088	3620	865.00	865.88	0.88	865.98	6

City of New Berlin
Calhoun Creek
25 Year/3 Hour Precipitation Event

Conduit			Upstream Junction		Existing Conditions		Future Conditions			Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth		
Mainstem											
Muskego Lake Inflow	493	553	C00000	0	804.00	807.27	3.27	807.44	3.44	0.17	60
College (2 - 5' RCP)	530	596	C00100	100	811.70	815.39	3.69	817.12	5.42	1.73	66
C00276L	530	596	C00276	276	805.00	815.39	10.39	817.12	12.12	1.73	66
C01161L	6	6	C01161	1,161	817.00	817.16	0.16	817.17	0.17	0.01	0
Rock Freeway (I-43)	7	7	C01436	1,436	818.30	822.13	3.83	822.22	3.92	0.09	0
(18" RCP)											
Tributary A											
CA0825L	310	344	CA0825	825	816.30	818.86	2.56	818.95	2.65	0.09	34
Racine Place (5' x 8' Box)	310	344	CA0853	853	816.35	821.69	5.34	822.40	6.05	0.71	34
CA0984L	311	344	CA0984	984	819.50	821.70	2.20	822.40	2.90	0.70	33
CA2499L	181	292	CA2499	2,499	827.10	830.55	3.45	832.24	5.14	1.69	111
College Avenue	182	242	CA2599	2,599	827.20	830.87	3.67	832.42	5.22	1.55	60
(2 7'92"x5'58" Arch)											
CA3059L	190	236	CA3059	3059	828.80	831.80	3.00	832.46	3.66	0.66	46
CA3309L	190	237	CA3309	3309	829.10	832.47	3.37	832.63	3.53	0.16	47
Racine Drive (6' RCP)	190	236	CA3399	3399	829.20	835.04	5.84	835.92	6.72	0.88	46
CA6009L	183	269	CA6009	6009	837.29	839.05	1.76	839.37	2.08	0.32	86
Tans Drive (4' RCP)	138	148	CA6047	6047	837.49	844.90	7.41	845.56	8.07	0.66	10
Tans Drive Overflow	64	195	CA6047	6047	844.10	844.90	0.80	845.56	1.46	0.66	131
Tributary C											
CC0675L	281	287	CC0675	675	828.00	830.98	2.98	831.02	3.02	0.04	6
CC1413L	265	270	CC1413	1413	842.00	843.68	1.68	843.70	1.70	0.02	5
Rock Freeway (I-43) (10'x7' Box)	266	271	CC1759	1759	848.90	851.14	2.24	851.17	2.27	0.03	5
Tributary B											
CB1130L	366	511	CB1130	1130	815.40	817.70	2.30	817.95	2.55	0.25	145
CB2388L	366	511	CB2388	2388	816.90	818.39	1.49	818.59	1.69	0.20	145
CB02533L	366	493	CB2533	2533	817.10	819.74	2.64	820.13	3.03	0.39	127
CB06368L	316	431	CB6368	6368	821.70	823.62	1.92	823.88	2.18	0.26	115
Rock Freeway (I-43) (18'x8' Box)	322	440	CB6623	6623	822.00	825.68	3.68	826.37	4.37	0.69	118
CB9798L	324	461	CB9798	9798	825.85	829.21	3.36	829.72	3.87	0.51	137
Beres Road (4' RCP)	118	122	CB9833	9833	825.95	832.19	6.24	832.71	6.76	0.52	4
Beres Road Overflow	211	351	CB9833	9833	830.60	832.19	1.59	832.71	2.11	0.52	140
CB10673L	323	462	CB10673	10673	826.60	832.23	5.63	832.76	6.16	0.53	139
CB11448L	263	426	CB11448	11448	827.12	834.37	7.25	832.92	5.80	(1.45)	163
Calhoun Road	264	302	CB11493	11493	827.44	834.72	7.28	835.86	8.42	1.14	38
(2 4' RCP)											
Calhoun Road Overflow	2	140	CB11493	11493	834.60	834.72	0.12	835.86	1.26	1.14	138
CB11673	242	384	CB11673	11673	828.10	834.72	6.62	835.86	7.76	1.14	142
CB12046L	248	386	CB12046	12046	829.40	834.72	5.32	835.86	6.46	1.14	138
CB14488L	318	469	CB14488	14488	837.90	840.03	2.13	840.46	2.56	0.43	151
CB19675L	108	293	CB19675	19675	856.10	857.34	1.24	858.10	2.00	0.76	185
CB20972L	101	336	CB20972	20972	860.50	862.01	1.51	862.93	2.43	0.92	235
Rock Freeway (I-43)	131	336	CB21112	21112	860.70	864.36	3.66	869.13	8.43	4.77	205

City of New Berlin
Calhoun Creek
25 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth		
(2.5' RCP)											
Tributary D											
CD0095L	68	62	CD0095	95	815.50	817.70	2.20	817.95	2.45	0.25	(6)
Rock Freeway (1-43) (8'x12' Box)	68	62	CD0290	290	815.80	818.27	2.47	818.15	2.35	(0.12)	(6)
Tributary E											
CE0070L	103	124	CE0070	70	817.30	819.75	2.45	820.14	2.84	0.39	21
Rock Freeway (1-43) (6'x10' Box)	103	125	CE0380	380	818.40	821.71	3.31	822.13	3.73	0.42	22
CE1688L	75	120	CE1688	1688	822.67	824.10	1.43	824.43	1.76	0.33	45
Martin Road	76	111	CE1728	1728	822.69	825.92	3.23	827.57	4.88	1.65	35
(2.3' RCP)											
Martin Road Overflow	0	22	CE1728	1728	827.10	825.92	---	827.57	0.47	#VALUE!	22
Tributary F											
CF0510L	75	58	CF0510	510	831.10	832.32	1.22	832.77	1.67	0.45	(17)
CF2058L	81	69	CF2058	2058	842.90	843.63	0.73	843.61	0.71	(0.02)	(12)
Beloit Road (4' RCP)	77	65	CF2088	2088	843.05	846.93	3.88	846.53	3.48	(0.40)	(12)
CF3620L	39	31	CF3620	3620	865.00	866.18	1.18	866.07	1.07	(0.11)	(8)

City of New Berlin
Calhoun Creek
100 Year/3 Hour Precipitation Event

Existing Flow (CFS)		Future Flow (CFS)	Upstream Junction			Existing Conditions		Future Conditions				
			Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation	Future Depth	Future Elevation Increase	Future Flow Increase	
Muskego Lake Inflow College (2 - 5' RCP)	617	634	C000000	0	804.00	807.61	3.61	807.65	3.65	0.04	17	
	666	684	C001000	100	812.58	819.15	6.57	819.69	7.11	0.54	18	
	666	684	C00276L	276	805.00	819.15	14.15	819.69	14.69	0.54	18	
	8	8	C01161L	1,161	817.00	819.15	2.15	819.69	2.69	0.54	0	
	8	8	C01436	1,436	818.30	825.03	6.73	825.09	6.79	0.06	0	
Tributary A												
CA0825L Racine Place (5' x 8' Box)	438	457	CA0825	825	816.30	819.16	2.86	819.70	3.40	0.54	19	
	438	457	CA0853	853	816.35	824.14	7.79	824.60	8.25	0.46	19	
	775	679	CA0984L	984	820.52	824.14	3.62	824.60	4.08	0.46	(96)	
	296	323	CA2499L	2,499	827.10	831.66	4.56	831.81	4.71	0.15	27	
	296	324	CA2599	2,599	827.20	831.87	4.67	831.99	4.79	0.12	28	
	(2 7.92'x5.58' Arch)	286	311	CA3059L	3059	828.80	832.14	3.34	832.22	3.42	0.08	25
		287	311	CA3309L	3309	829.10	832.62	3.52	832.72	3.62	0.10	24
		287	311	CA3399	3399	829.20	837.78	8.58	838.63	9.43	0.85	24
		403	467	CA6009L	6009	837.29	839.74	2.45	839.88	2.59	0.14	64
	Tans Drive (4' RCP)	152	158	CA6047	6047	837.49	845.86	8.37	846.29	8.80	0.43	6
272		399	CA6047	6047	844.10	845.86	1.76	846.29	2.19	0.43	127	
Tributary C												
CC0675L	421	427	CC0675	675	828.00	831.67	3.67	831.70	3.70	0.03	6	
	395	403	CC1413L	1413	842.00	844.09	2.09	844.12	2.12	0.03	8	
	396	404	CC1759	1759	848.90	851.86	2.96	851.90	3.00	0.04	8	
Tributary B												
CB1130L	733	875	CB1130	1130	815.40	819.17	3.77	819.70	4.30	0.53	142	
	733	875	CB2388L	2388	816.90	819.27	2.37	819.76	2.86	0.49	142	
	733	864	CB2533L	2533	817.10	820.76	3.66	821.05	3.95	0.29	131	
	625	752	CB6368L	6368	821.70	824.26	2.56	824.46	2.76	0.20	127	
	635	766	CB6623	6623	822.00	827.36	5.36	827.96	5.96	0.60	131	
	667	825	CB9798L	9798	825.85	830.26	4.41	830.52	4.67	0.26	158	
	126	128	CB9833	9833	825.95	833.37	7.42	833.77	7.82	0.40	2	
	566	715	CB9833	9833	830.60	833.37	2.77	833.77	3.17	0.40	149	
	675	820	CB10673L	10673	826.60	833.44	6.84	833.84	7.24	0.40	145	
	592	729	CB11448L	11448	827.12	833.58	6.46	833.98	6.86	0.40	137	
Calhoun Road (2 4' RCP)	302	320	CB11493	11493	827.44	836.54	9.10	837.00	9.56	0.46	18	
	Calhoun Road Overflow	307	447	CB11493	11493	834.60	836.54	1.94	837.00	2.40	0.46	140
		535	656	CB11673	11673	828.10	836.54	8.44	837.00	8.90	0.46	121
		535	655	CB12046L	12046	829.40	836.54	7.14	837.00	7.60	0.46	120
		585	733	CB14488L	14488	837.90	840.72	2.82	841.04	3.14	0.32	148
	207	440	CB19675L	19675	856.10	857.79	1.69	858.45	2.35	0.66	233	
	193	488	CB20972L	20972	860.50	862.36	1.86	863.35	2.85	0.99	295	
	193	488	CB21112	21112	860.70	865.21	4.51	873.07	12.37	7.86	295	
	Rock Freeway (I-43)											

City of New Berlin
Calhoun Creek
100 Year/3 Hour Precipitation Event

	Existing Flow (CFS)		Future Flow (CFS)	Upstream Junction			Existing Conditions		Future Conditions		
				Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth	Future Elevation Increase
(2.5' RCP) Rock Freeway Overflow Tributary D	0		6	CB21112	21112	872.78	865.21	-7.57	873.07	0.29	7.86
CD0095L	131		116	CD0095	95	815.50	819.17	3.67	819.70	4.20	0.53
Rock Freeway (1-43) (8'x12' Box) Tributary E	137		122	CD0290	290	815.80	819.51	3.71	819.70	3.90	0.19
CE0070L	169		185	CE0070	70	817.30	820.76	3.46	821.05	3.75	0.29
Rock Freeway (1-43) (6'x10' Box)	172		188	CE0380	380	818.40	822.95	4.55	823.24	4.84	0.29
CE1688L	151		197	CE1688	1688	822.67	824.62	1.95	824.91	2.24	0.29
Martin Road (2.3' RCP)	115		122	CE1728	1728	822.69	827.80	5.11	828.20	5.51	0.40
Martin Road Overflow Tributary F	48		114	CE1728	1728	827.10	827.80	0.70	828.20	1.10	0.40
CF0510L	209		149	CF0510	510	831.10	833.44	2.34	833.85	2.75	0.41
CF2058L	212		168	CF2058	2058	844.70	845.96	1.26	845.83	1.13	(0.13)
Beloit Road (4' RCP)	46		41	CF2088	2088	843.05	847.87	4.82	847.68	4.63	(0.19)
Beloit Road Overflow	164		122	CF2088	2088	846.90	847.87	0.97	847.68	0.78	(0.19)
CF3620L	90		66	CF3620	3620	865.00	866.58	1.58	866.43	1.43	(0.15)

City of New Berlin
Deer Creek
2 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	
Mainstem								
City Limit	461	D00000	0	832.40	834.12	1.72	834.39	0.27
Green Field Avenue (3' 5" RCP and 1' 7"x13" Box)	460	D00070	70	832.50	835.74	3.24	836.17	0.43
D02905L	443	D02905	2905	834.30	837.12	2.82	837.53	0.41
C & NW Railroad (2' 7" CMP)	452	D03050	3050	834.41	839.85	5.44	840.55	0.70
D03800L	393	D03800	3800	835.60	840.28	4.68	840.88	0.60
Rogers Drive (5' 2"x20" Box)	392	D03838	3838	835.70	840.31	4.61	840.96	0.65
D05639L	330	D05639	5639	838.20	842.13	3.93	842.41	0.28
Lincoln Avenue (5' 2"x10" Box)	334	D05675	5675	838.30	842.39	4.09	842.73	0.34
D06012L	241	D06012	6012	838.70	842.75	4.05	843.09	0.34
D07643L	215	D07643	7643	841.87	845.32	3.45	845.71	0.34
Glendale Drive (5' 8"x12" Box)	219	D07701	7701	841.90	845.34	3.44	845.76	0.32
D08878L	185	D08878	8878	847.88	851.33	3.45	851.83	0.50
Cleveland Avenue (3' 6" CMP)	185	D09061	9061	848.38	851.68	3.30	852.24	0.56
D10721L	154	D10721	10721	851.30	854.37	3.07	854.79	0.42
D10983L	142	D10983	10983	851.70	854.77	3.07	855.19	0.42
James Drive (5'x10" Concrete Box)	142	D11033	11033	851.78	854.78	3.00	855.21	0.43
D11419L	140	D11419	11419	852.16	855.34	3.18	855.78	0.44
Moorland Road (8'x9" Concrete Box)	140	D11539	11539	852.35	855.66	3.31	856.23	0.57
D13194L	130	D13194	13194	855.40	859.09	3.69	859.33	0.24
D14549L	146	D14549	14549	857.90	861.41	3.51	861.77	0.36
D15639L	139	D15639	15639	859.90	862.01	2.11	862.43	0.42
West San Mateo Drive (8'x16" Box)	139	D15709	15709	860.00	862.16	2.16	862.59	0.43
D15864L	139	D15864	15864	861.50	863.03	1.53	863.29	0.26
National Avenue (10'x10" Box and 5.25'x8.17" Elliptical)	139	D16196	16196	861.60	864.19	2.59	864.58	0.39
D17660L	127	D17660	17660	862.00	865.89	3.89	866.19	0.30
D19266L	87	D19266	19266	860.00	866.26	6.26	866.65	0.39
D22416L	30	D22416	22416	863.20	866.42	3.22	866.78	0.36
Tributary A								
DA0440L	43	DA0440	440	843.02	844.10	1.08	844.12	0.02
162nd Street (5' RCP)	44	DA0490	490	843.22	845.53	2.31	845.57	0.04

City of New Berlin
Deer Creek
10 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	
Mainstem								
OUTFALL	731	D00000	0	832.40	834.68	2.28	834.97	155
Green Field Avenue	731	D00070	70	832.50	836.62	4.12	837.09	154
(3' 5" RCP and 1' 7"x13" Box)								
D02905L	690	D02905	2905	834.30	837.98	3.68	838.38	144
C & NW Railroad	696	D03050	3050	834.41	841.74	7.33	842.89	144
(2' 7" CMP)								
D03800L	613	D03800	3800	835.60	841.94	6.34	843.02	128
Rogers Drive (5' 2"x20" Box)	609	D03838	3838	835.70	842.07	6.37	843.16	52
Rogers Drive Overflow	0	D03838	3838	835.70	842.07	6.37	843.16	92
D05639L	512	D05639	5639	838.20	843.04	4.84	843.84	108
Lincoln Avenue (5' 2"x10" Box)	530	D05675	5675	838.30	843.55	5.25	844.48	87
D06012L	430	D06012	6012	838.70	843.85	5.15	844.69	89
D07643L	396	D07643	7643	841.87	846.28	4.41	846.64	83
Glendale Drive (5' 8"x12" Box)	397	D07701	7701	841.90	846.32	4.42	846.69	83
D08878L	360	D08878	8878	847.88	852.47	4.59	852.71	54
Cleveland Avenue (3' 6" CMP)	360	D09061	9061	848.38	853.05	4.67	853.38	54
D10721L	313	D10721	10721	851.30	855.40	4.10	855.69	53
D10983L	284	D10983	10983	851.70	855.78	4.08	856.08	53
James Drive	284	D11033	11033	851.78	855.81	4.03	856.10	52
(5'x10' Concrete Box)								
D11419L	280	D11419	11419	852.16	856.36	4.20	856.66	54
Moorland Road (8'x9' Concrete Box)	280	D11539	11539	852.35	856.97	4.62	857.38	54
D13194L	258	D13194	13194	855.40	859.56	4.16	859.78	50
D14549L	258	D14549	14549	857.90	862.16	4.26	862.52	60
D15639L	255	D15639	15639	859.90	862.93	3.03	863.33	59
West San Mateo Drive (8'x16' Box)	255	D15709	15709	860.00	863.11	3.11	863.52	59
D15864L	254	D15864	15864	861.50	863.65	2.15	864.00	60
National Avenue	254	D16196	16196	861.60	865.10	3.50	865.50	59
(10'x10' Box and 5.25'x8.17' Elliptical)								
D17660L	230	D17660	17660	862.00	866.88	4.88	867.17	35
D19266L	162	D19266	19266	860.00	867.28	7.28	867.59	43
D22416L	56	D22416	22416	863.20	867.45	4.25	867.75	9
Tributary A								
DA0440L	70	DA0440	440	843.02	844.43	1.41	844.69	3
162nd Street (5' RCP)	71	DA0490	490	843.22	846.14	2.92	846.19	3

City of New Berlin
Deer Creek
25 Year/3 Hour Precipitation Event

Conduit		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	
Mainstem								
City Limit	911	D00000	0	832.40	835.01	2.61	835.27	0.26
Green Field Avenue (3' 5" RCP and 1' 7"x13" Box)	911	D00070	70	832.50	837.16	4.66	837.64	0.48
D02905L	858	D02905	2905	834.30	838.44	4.14	838.79	0.35
C & NW Railroad (2' 7" CMP)	864	D03050	3050	834.41	843.10	8.69	844.21	1.11
D03800L	772	D03800	3800	835.60	843.22	7.62	844.29	1.07
Rogers Drive (5.2'x20' Box)	673	D03838	3838	835.70	843.36	7.66	844.40	1.04
Rogers Drive Overflow	122	D03838	3838	842.10	843.36	1.26	844.40	1.04
D05639L	660	D05639	5639	838.20	844.03	5.83	844.87	0.84
Lincoln Avenue (5.2'x10' Box)	662	D05675	5675	838.30	844.76	6.46	845.72	0.96
Lincoln Avenue Overflow	0	D05675	5675	845.10	844.76	-0.34	845.72	0.96
D06012L	553	D06012	6012	838.70	844.95	6.25	845.84	0.89
D07643L	503	D07643	7643	841.87	846.73	4.86	847.04	0.31
Glendale Drive (5.8'x12' Box)	505	D07701	7701	841.90	846.79	4.89	847.11	0.32
D08878L	459	D08878	8878	847.88	852.90	5.02	853.10	0.20
Cleveland Avenue (3' 6" CMP)	459	D09061	9061	848.38	853.68	5.30	854.02	0.34
D10721L	410	D10721	10721	851.30	855.90	4.60	856.13	0.23
D10983L	375	D10983	10983	851.70	856.29	4.59	856.52	0.23
James Drive (5'x10' Concrete Box)	375	D11033	11033	851.78	856.32	4.54	856.57	0.25
D11419L	372	D11419	11419	852.16	856.88	4.72	857.13	0.25
Moorland Road (8'x9' Concrete Box)	372	D11539	11539	852.35	857.67	5.32	858.02	0.35
D13194L	329	D13194	13194	855.40	859.86	4.46	859.99	0.13
D14549L	334	D14549	14549	857.90	862.55	4.65	862.85	0.30
D15639L	335	D15639	15639	859.90	863.43	3.53	863.79	0.36
West San Mateo Drive (8'x16' Box)	335	D15709	15709	860.00	863.63	3.63	864.00	0.37
D15864L	335	D15864	15864	861.50	864.11	2.61	864.45	0.34
National Avenue (10'x10' Box and 5.25'x8.17' Elliptical)	335	D16196	16196	861.60	865.65	4.05	866.06	0.41
D17660L	295	D17660	17660	862.00	867.38	5.38	867.67	0.29
D19266L	216	D19266	19266	860.00	867.77	7.77	867.99	0.22
D22416L	79	D22416	22416	863.20	867.96	4.76	868.18	0.22
Tributary A								
DA0440L	91	DA0440	440	843.02	844.95	1.93	845.84	0.89
162nd Street (5' RCP)	91	DA0490	490	843.22	846.54	3.32	846.60	0.06

City of New Berlin
Deer Creek
100 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)	
Mainstem										
City Limit	1,210	1,340	D00000	0	832.40	835.51	3.11	835.73	3.33	130
Green Field Avenue (3' 5" RCP and 1' 7"x13" Box)	1,207	1,341	D00070	70	832.50	838.06	5.56	838.43	5.93	134
D02905L	1,110	1,230	D02905	2905	834.30	839.08	4.78	839.35	5.05	120
C & NW Railroad (2' 7" CMP)	1,124	1,250	D03050	3050	834.41	845.13	10.72	846.10	11.69	126
D03800L	1,020	1,120	D03800	3800	835.60	845.18	9.58	846.13	10.53	100
Rogers Drive (5.2'x20" Box)	767	869	D03838	3838	835.70	845.32	9.62	846.26	10.56	102
Rogers Drive Overflow	583	653	D03838	3838	842.10	845.32	3.22	846.26	4.16	70
D05639L	1,090	1,100	D05639	5639	838.20	845.72	7.52	846.66	8.46	10
Lincoln Avenue (5.2'x10" Box)	801	830	D05675	5675	838.30	846.52	8.22	847.21	8.91	29
Lincoln Avenue Overflow	188	379	D05675	5675	845.10	846.52	1.42	847.21	2.11	191
D06012L	749	807	D06012	6012	838.70	846.64	7.94	847.30	8.60	58
D07643L	691	803	D07643	7643	841.87	847.67	5.80	848.13	6.26	112
Glendale Drive (5.8'x12" Box)	689	805	D07701	7701	841.90	847.79	5.89	848.26	6.36	116
D08878L	628	671	D08878	8878	847.88	853.48	5.60	853.62	5.74	43
Cleveland Avenue (3' 6" CMP)	627	672	D09061	9061	848.38	854.92	6.54	855.25	6.87	45
D10721L	576	620	D10721	10721	851.30	856.63	5.33	856.85	5.55	44
D10983L	536	580	D10983	10983	851.70	857.01	5.31	857.23	5.53	44
James Drive (5'x10" Concrete Box)	537	579	D11033	11033	851.78	857.09	5.31	857.32	5.54	42
D11419L	535	579	D11419	11419	852.16	857.65	5.49	857.86	5.70	44
Moorland Road (8'x9" Concrete Box)	534	579	D11539	11539	852.35	858.78	6.43	859.06	6.71	45
D13194L	483	532	D13194	13194	855.40	860.25	4.85	860.41	5.01	49
D14549L	490	548	D14549	14549	857.90	863.23	5.33	863.46	5.56	58
D15639L	489	547	D15639	15639	859.90	864.25	4.35	864.52	4.62	58
West San Mateo Drive (8'x16" Box)	489	548	D15709	15709	860.00	864.49	4.49	864.77	4.77	59
D15864L	489	548	D15864	15864	861.50	864.90	3.40	865.17	3.67	59
National Avenue (10'x10" Box and 5.25'x8.17" Elliptical)	489	547	D16196	16196	861.60	866.66	5.06	867.08	5.48	58
D17660L	425	468	D17660	17660	862.00	868.23	6.23	868.51	6.51	43
D19266L	323	381	D19266	19266	860.00	868.46	8.46	868.71	8.71	58
D22416L	130	144	D22416	22416	863.20	868.69	5.49	868.92	5.72	14
Tributary A										
DA0404L	137	141	DA0404	440	843.02	846.64	3.62	847.30	4.28	4
162nd Street (5' RCP)	132	134	DA0490	490	843.22	847.39	4.17	847.42	4.20	2

City of New Berlin
Poplar Creek

2 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions			
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)	Future Elevation Increase	Future Flow Increase
Mainstem											
OUTFALL	64	105	P00000	0	822.30	824.00	1.70	824.26	1.96	0.26	41
P01913L	62	102	P01913	1,913	822.50	825.88	3.38	826.19	3.69	0.31	40
P03490L	59	97	P03490	3,490	823.40	826.32	2.92	826.82	3.42	0.50	38
P03598L	59	99	P03588	3,588	823.45	826.35	2.90	826.87	3.42	0.52	40
P03680L	59	99	P03680	3,680	823.50	826.37	2.87	826.89	3.39	0.52	40
P07057L	41	63	P07057	7,057	837.00	838.16	1.16	838.45	1.45	0.29	21
P09651L	212	328	P09651	9,651	847.50	848.31	0.81	848.46	0.96	0.15	116
Tributary A											
PA0435L	26	54	PA0435	435	824.10	826.37	2.27	826.90	2.80	0.53	28
PA1655L	25	53	PA1655	1,655	825.00	827.42	2.42	827.80	2.80	0.38	28
PA3360L	26	54	SOUTHR	3,360	825.30	827.56	2.26	828.04	2.74	0.48	27
PA10375L	150	232	PA10375	10,375	827.00	830.91	3.91	831.69	4.69	0.78	82
PA10850L	22	33	PA10850	10,850	834.50	835.23	0.73	835.38	0.88	0.15	12
PA12880L	158	234	PA12880	12,880	836.00	838.37	2.37	838.86	2.86	0.49	76
PA13450L	159	235	PA13450	13,450	841.00	843.27	2.27	843.76	2.76	0.49	76
PA16995L	158	222	PA16995	16,995	845.89	849.72	3.83	850.16	4.27	0.44	64
Cleveland Avenue (2.4.5' RCP)	161	230	PA17138	17,138	846.54	850.35	3.81	851.45	4.91	1.10	69
PA20253L	159	229	PA20253	20,253	854.00	856.24	2.24	856.74	2.74	0.50	70
PA20968L	150	221	PA20968	20,968	855.88	860.76	4.88	861.45	5.57	0.69	71
Calhoun Road (3.5' RCP)	150	221	PA21034	21,034	856.28	860.83	4.55	861.63	5.35	0.80	72
PA21314L	108	152	PA21314	21,314	857.00	860.95	3.95	861.71	4.71	0.76	44
PA21889L	58	81	PA21889	21,889	858.46	861.09	2.63	861.84	3.38	0.75	23
Calhoun Road (2.5' RCP)	60	81	PA21952	21,952	858.69	861.10	2.41	861.85	3.16	0.75	21
PA23632L	55	77	PA23632	23,632	862.03	865.47	3.44	865.87	3.84	0.40	22
Coffee Road (3.5.5' RCP)	55	78	PA23672	23,672	862.44	865.47	3.03	865.88	3.44	0.41	23
PA28197L	86	108	PA28197	28,197	874.63	876.48	1.85	876.76	2.13	0.28	22
Observatory Road (8.58'x5.92 Arch)	96	123	PA28237	28,237	875.10	876.99	1.89	877.18	2.08	0.19	27
PA30147L	88	118	PA30147	30,147	879.90	882.78	2.88	882.97	3.07	0.19	30
PA32172L	86	115	PA32172	32,172	884.91	887.36	2.45	887.44	2.53	0.08	29
Observatory Road (5.42'x3.33' Arch)	125	157	PA32214	32,214	885.25	888.37	3.12	889.07	3.82	0.70	32
Tributary AB											
PAB4480L	24	89	PAB4480	4480	873.94	874.61	0.67	875.36	1.42	0.75	65
Cleveland Avenue (3.5' RCP)	39	94	PAB4611	4611	876.34	879.51	3.17	887.27	10.93	7.76	54
Cleveland Road Overflow	0	25	PAB4611	4611	886.60	879.51	-7.09	887.27	0.67	7.76	25
Tributary AC											
PAC2000L	41	58	PAC2000	2000	874.12	874.56	0.44	874.66	0.54	0.10	18
Cleveland Avenue (5' RCP)	32	46	PAC2130	2130	875.41	877.75	2.34	878.22	2.81	0.47	14
PAC4150L	36	56	PAC4150	4150	892.28	892.82	0.54	892.98	0.70	0.16	21
Willow Road (2.92'x2' Arch)	28	33	PAC4194	4194	892.78	897.07	4.29	897.25	4.47	0.18	5
Willow Road Overflow	22	40	PAC4194	4194	896.60	897.07	0.47	897.25	0.65	0.18	18

2 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)		
Tributary AD											
PAD0345L	67	81	PAD0345	345	857.70	860.96	3.26	861.72	4.02	0.76	15
PAD2060L	25	30	PAD2060	2060	861.40	862.08	0.68	862.16	0.76	0.08	5
166th Street (3 5.5'x3.75' Box))	33	39	PAD2113	2113	861.47	862.49	1.02	862.55	1.08	0.06	6
Tributary AE											
PAE0335	85	98	PAE0335	335	859.01	861.03	2.02	861.76	2.75	0.73	14
Victor Road (3 4.88'x3' Arch)	83	99	PAE0384	384	859.53	861.09	1.56	861.80	2.27	0.71	16
PAE1379	50	65	PAE1379	1379	861.71	863.44	1.73	863.62	1.91	0.18	15
Ryerson Avenue (2 4.75'x3.17' Arch)	51	63	PAE1423	1423	862.22	863.56	1.34	863.77	1.55	0.21	12
Tributary B											
PB0390L	21	18	PB0390	390	827.04	827.56	0.52	828.04	1.00	0.48	(3)
C & NW Railroad (4' RCP)	21	22	NORTHRR	440	827.20	828.25	1.05	828.18	0.98	(0.07)	1
Tributary C											
PC1595L	3	5	PC1595	1595	829.41	829.47	0.06	829.49	0.08	0.02	2
PCGRVL2 (1.75' RCP)	3	6	PC1615	1615	829.88	830.72	0.84	830.99	1.11	0.27	2
PC2205L	5	6	PC2205	2205	831.95	832.02	0.07	832.03	0.08	0.01	1
Lincoln Avenue (2'x1.5' Arch)	5	6	PC2254	2254	833.32	834.46	1.14	835.22	1.90	0.76	1
PC5034L	7	13	PC5034	5034	840.80	841.30	0.50	841.46	0.66	0.16	6
PC7729L	9	15	PC7729	7729	847.98	848.34	0.36	848.44	0.46	0.10	6
Cleveland Avenue (7.25'x5.25' Arch)	9	15	PC7818	7818	848.95	849.62	0.67	849.84	0.89	0.22	7
PC10533L	31	73	PC10533	10533	884.20	884.53	0.33	884.67	0.47	0.14	42
PC12423L	11	15	PC12423	12423	910.00	910.37	0.37	910.39	0.39	0.02	4

City of New Berlin
Poplar Creek
10 Year/3 Hour Precipitation Event

Conduit	Existing		Upstream Junction		Existing Conditions		Future Conditions		Future Flow Increase
	Name	Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Elevation Increase
Mainstem	OUTFALL	169	P00000	0	822.30	824.66	2.36	825.05	0.39
	P01913L	169	P01913	1,913	822.50	826.56	4.06	826.89	0.33
	P03490L	169	P03490	3,490	823.40	827.43	4.03	827.81	0.38
	P03598L	169	P03588	3,588	823.45	827.53	4.08	827.98	0.45
	P03680L	169	P03680	3,680	823.50	827.55	4.05	828.01	0.46
	P07057L	94	P07057	7,057	837.00	838.79	1.79	839.13	0.34
	P09651L	347	P09651	9,651	847.50	848.48	0.98	848.65	0.17
									170
Tributary A	PA0435L	145	PA0435	435	824.10	827.65	3.55	828.14	0.49
	PA1655L	143	PA1655	1,655	825.00	828.40	3.40	828.62	0.22
	PA3360L	145	PA3360	3,360	825.30	828.79	3.49	829.05	0.26
	PA10375L	336	PA10375	10,375	827.00	832.24	5.24	832.52	0.28
	PA10850L	44	PA10850	10,850	834.50	835.50	1.00	835.65	0.15
	PA12880L	305	PA12880	12,880	836.00	839.25	3.25	839.61	0.36
	PA13450L	305	PA13450	13,450	841.00	844.15	3.15	844.49	0.34
	PA16995L	298	PA16995	16,995	845.89	850.51	4.62	850.71	0.20
	Cleveland Avenue (2.4' RCP)	307	PA17138	17,138	846.54	853.24	6.70	854.72	1.48
	PA20253L	301	PA20253	20,253	854.00	857.18	3.18	857.69	0.51
Calhoun Road (3' RCP)	PA20968L	269	PA20968	20,968	855.88	861.58	5.70	861.92	0.34
	PA21034	269	PA21034	21,034	856.28	861.84	5.56	862.40	0.56
	PA21314L	179	PA21314	21,314	857.00	861.94	4.94	862.48	0.54
	PA21889L	112	PA21889	21,889	858.46	862.07	3.61	862.58	0.51
	Calhoun Road (2' 5' RCP)	112	PA21952	21,952	858.69	862.08	3.39	862.59	0.51
	PA23632L	104	PA23632	23,632	862.03	866.58	4.55	866.87	0.29
	Coffee Road (3' 5' RCP)	105	PA23672	23,672	862.44	866.59	4.15	866.89	0.30
	PA28197L	150	PA28197	28,197	874.63	876.98	2.35	877.12	0.14
	Observatory Road (8.5'x5.92' Arch)	153	PA28237	28,237	875.10	877.33	2.23	877.64	0.31
	PA30147L	140	PA30147	30,147	879.90	883.16	3.26	883.40	0.24
Observatory Road (5.42'x3.33' Arch)	PA32172L	162	PA32172	32,172	884.91	887.50	2.59	887.56	0.06
	PA32214L	188	PA32214	32,214	885.25	889.68	4.43	890.97	1.29
									51
Tributary AB	PAB4480L	40	PAB4480	4,480	873.94	874.84	0.90	875.72	0.88
	Cleveland Avenue (3.5' RCP)	57	PAB4611	4,611	876.34	884.57	8.23	887.65	3.08
	Cleveland Road Overflow	0	PAB4611	4,611	886.60	884.57	-2.03	887.65	3.08
									61
Tributary AC	PAC2000L	67	PAC2000	2,000	874.12	874.71	0.59	874.79	0.08
	Cleveland Avenue (5' RCP)	53	PAC2130	2,130	875.41	878.47	3.06	879.09	0.62
									27
									19

City of New Berlin
Poplar Creek
10 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation (ft)	Future Depth (ft)		
PAC4150L	59	93	PAC4150	4150	892.28	893.01	0.73	893.23	0.95	0.22	34
Willow Road (2.92'x2' Arch)	33	40	PAC4194	4194	892.78	897.25	4.47	897.47	4.69	0.22	7
Willow Road Overflow	40	71	PAC4194	4194	896.60	897.25	0.65	897.47	0.87	0.22	31
Tributary AD											
PAD0345L	111	142	PAD0345	345	857.70	861.95	4.25	862.49	4.79	0.54	31
PAD2060L	40	49	PAD2060	2060	861.40	862.29	0.89	862.51	1.11	0.22	9
166th Street (3.5'x3.75' Box))	50	61	PAD2113	2113	861.47	862.65	1.18	862.74	1.27	0.09	11
Tributary AE											
PAE0335	138	161	PAE0335	335	859.01	862.00	2.99	862.53	3.52	0.53	23
Victor Road (3.4.88'x3' Arch)	136	163	PAE0384	384	859.53	862.06	2.53	862.70	3.17	0.64	27
PAE1379	83	104	PAE1379	1379	861.71	863.85	2.14	864.06	2.35	0.21	22
Ryerson Drive (2.4.75'x3.17 Arch)	87	104	PAE1423	1423	862.22	864.05	1.83	864.32	2.10	0.27	17
Tributary B											
PB0390L	47	58	PB0390	390	827.04	828.79	1.75	829.05	2.01	0.26	11
C & NW Railroad (4' RCP)	64	62	NORTHRR	NORTHRR	827.20	828.79	1.59	829.05	1.85	0.26	(2)
Tributary C											
PC1595L	8	8	PC1595	1595	829.41	829.51	0.10	829.51	0.10	0.00	0
PCGRVL2 (1.75' RCP)	8	8	PC1615	1615	829.88	831.28	1.40	831.33	1.45	0.05	0
PC2205L	9	9	PC2205	2205	831.95	832.04	0.09	832.05	0.10	0.01	0
Lincoln Avenue (2'x1.5' Arch)	9	9	PC2254	2254	833.32	837.61	4.29	838.11	4.79	0.50	0
PC5034L	38	48	PC5034	5034	840.80	841.89	1.09	842.00	1.20	0.11	10
PC7729L	40	49	PC7729	7729	847.98	848.68	0.70	848.74	0.76	0.06	9
Cleveland Avenue (7.25'x5.25' Arch)	41	50	PC7818	7818	848.95	850.44	1.49	850.63	1.68	0.19	9
PC10533L	90	159	PC10533	10533	884.20	884.67	0.47	884.80	0.60	0.13	69

City of New Berlin
Poplar Creek

25 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)	
Mainstem										
OUTFALL	348	438	P00000	0	822.30	825.40	3.10	825.67	3.37	90
P01913L	348	438	P01913	1,913	822.50	827.29	4.79	827.55	5.05	90
P03490L	355	442	P03490	3,490	823.40	828.15	4.75	828.35	4.95	87
P03598L	355	443	P03588	3,588	823.45	828.41	4.96	828.71	5.26	88
P03680L	355	445	P03680	3,680	823.50	828.45	4.95	828.76	5.26	90
P07057L	150	196	P07057	7,057	837.00	839.27	2.27	839.59	2.59	46
P09651L	450	701	P09651	9,651	847.50	848.59	1.09	848.76	1.26	251
Tributary A										
PA0435L	300	369	PA0435	435	824.10	828.62	4.52	828.94	4.84	69
PA1655L	297	364	PA1655	1,655	825.00	828.91	3.91	829.17	4.17	67
PA3360L	301	365	SOUTHR	3,360	825.30	829.34	4.04	829.54	4.24	64
PA10375L	541	665	PA10375	10,375	827.00	832.59	5.59	832.78	5.78	124
PA10850L	70	90	PA10850	10,850	834.50	835.72	1.22	835.87	1.37	20
PA12880L	398	447	PA12880	12,880	836.00	839.70	3.70	839.92	3.92	49
PA13450L	399	448	PA13450	13,450	841.00	844.58	3.58	844.73	3.73	49
PA16995L	383	421	PA16995	16,995	845.89	850.82	4.93	850.98	5.09	38
Cleveland Avenue (2.4' RCP)	384	422	PA17138	17,138	846.54	855.47	8.93	856.60	10.06	38
PA20253L	410	507	PA20253	20,253	854.00	857.76	3.76	858.22	4.22	97
PA20968L	357	455	PA20968	20,968	855.88	861.87	5.99	862.09	6.21	98
Calhoun Road (3.5' RCP)	357	456	PA21034	21,034	856.28	862.34	6.06	862.86	6.58	99
PA21314L	229	280	PA21314	21,314	857.00	862.43	5.43	862.92	5.92	51
PA21889L	179	214	PA21889	21,889	858.46	862.56	4.10	863.02	4.56	35
Calhoun Road (2.5' RCP)	179	214	PA21952	21,952	858.69	862.57	3.88	863.03	4.34	35
PA23632L	175	210	PA23632	23,632	862.03	867.20	5.17	867.46	5.43	35
Coffee Road (3.5' RCP)	176	210	PA23672	23,672	862.44	867.23	4.79	867.51	5.07	34
PA28197L	230	300	PA28197	28,197	874.63	877.37	2.74	877.56	2.93	70
Observatory Road (8.58'x5.92' Arch)	254	318	PA28237	28,237	875.10	878.14	3.04	878.65	3.55	64
PA30147L	235	293	PA30147	30,147	879.90	883.71	3.81	883.85	3.95	58
PA32172L	188	212	PA32172	32,172	884.91	887.57	2.66	887.64	2.73	24
Observatory Road (5.42'x3.33' Arch)	236	302	PA32214	32,214	885.25	890.87	5.62	892.85	7.60	66
Tributary AB										
PAB4480L	65	162	PAB4480	4,480	873.94	875.13	1.19	875.87	1.93	97
Cleveland Avenue (3.5' RCP)	73	119	PAB4611	4,611	876.34	886.82	10.48	887.91	11.57	46
Cleveland Road Overflow	2	96	PAB4611	4,611	886.60	886.82	0.22	887.91	1.31	93
Tributary AC										
PAC2000L	93	119	PAC2000	2,000	874.12	874.78	0.66	874.86	0.74	26

25 Year/3 Hour Precipitation Event

Conduit	Existing		Upstream Junction			Existing Conditions		Future Conditions			Future Flow Increase
	Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)	Future Elevation Increase	
Cleveland Avenue (5' RCP)	76	95	PAC2130	2130	875.41	879.27	3.86	880.06	4.65	0.79	19
	76	120	PAC4150	4150	892.28	893.12	0.84	893.37	1.09	0.25	45
	37	45	PAC4194	4194	892.78	897.35	4.57	897.61	4.83	0.26	8
	53	94	PAC4194	4194	896.60	897.35	0.75	897.61	1.01	0.26	41
Tributary AD											
	151	185	PAD0345	345	857.70	862.44	4.74	862.93	5.23	0.49	34
	52	63	PAD2060	2060	861.40	862.48	1.08	862.96	1.56	0.48	11
	64	78	PAD2113	2113	861.47	862.77	1.30	862.98	1.51	0.21	14
Tributary AE											
	177	205	PAE0335	335	859.01	862.48	3.47	862.97	3.96	0.49	28
	176	207	PAE0384	384	859.53	862.60	3.07	863.23	3.70	0.63	31
	109	133	PAE1379	1379	861.71	864.12	2.41	864.34	2.63	0.22	24
Tributary B											
	115	136	PAE1423	1423	862.22	864.39	2.17	864.70	2.48	0.31	20
Tributary C											
	66	85	PB0390	390	827.04	829.34	2.30	829.54	2.50	0.20	20
	95	84	NORTHRR	440	827.20	829.34	2.14	829.54	2.34	0.20	(11)
Cleveland Avenue (7.25'x5.25' Arch)											
	13	39	PC1595L	1595	829.41	829.54	0.13	829.55	0.14	0.01	26
	13	14	PC1615	1615	829.88	832.89	3.01	833.40	3.52	0.51	1
	33	43	PC2205	2205	831.95	832.89	0.94	833.40	1.45	0.51	10
	22	25	PC2254	2254	833.32	838.60	5.28	838.69	5.37	0.09	4
	22	32	PC2254	2254	838.10	838.60	0.50	838.69	0.59	0.09	10
	71	82	PC5034	5034	840.80	842.20	1.40	842.29	1.49	0.09	11
	69	80	PC7729L	7729	847.98	848.85	0.87	848.91	0.93	0.06	11
	71	82	PC7818	7818	848.95	851.02	2.07	851.21	2.26	0.19	11
	137	223	PC10533L	10533	884.20	884.75	0.55	884.88	0.68	0.13	86
	25	33	PC12423L	12423	910.00	910.54	0.54	910.57	0.57	0.03	8

City of New Berlin
Poplar Creek

100 Year/3 Hour Precipitation Event

Conduit	Name	Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
		Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Surface Elevation (ft)	Future Depth (ft)	
Mainstem	OUTFALL	P00000	0	822.30	826.28	3.98	826.45	4.15	74
	P01913L	P01913	1,913	822.50	828.01	5.51	828.12	5.62	74
	P03490L	P03490	3,490	823.40	828.77	5.37	828.88	5.48	72
	P03598L	P03588	3,588	823.45	829.39	5.94	829.59	6.14	71
	P03680L	P03680	3,680	823.50	829.45	5.95	829.66	6.16	71
	P07057L	P07057	7,057	837.00	840.09	3.09	840.38	3.38	60
	P09651L	P09651	9,651	847.50	848.77	1.27	848.97	1.47	313
	Tributary A								
	PA0435L	PA0435	435	824.10	829.68	5.58	829.89	5.79	58
	PA1655L	PA1655	1,655	825.00	829.81	4.81	830.00	5.00	59
Cleveland Avenue (2.4' RCP)	PA3360L	SOUTHRR	3,360	825.30	830.07	4.77	830.23	4.93	55
	PA10375L	PA10375	10,375	827.00	832.94	5.94	833.05	6.05	108
	PA10850L	PA10850	10,850	834.50	836.03	1.53	836.10	1.60	10
	PA12880L	PA12880	12,880	836.00	840.16	4.16	840.25	4.25	28
	PA13450L	PA13450	13,450	841.00	844.86	3.86	844.94	3.94	28
	PA16995L	PA16995	16,995	845.89	851.19	5.30	851.27	5.38	23
	PA17138	PA17138	17,138	846.54	858.42	11.88	859.18	12.64	22
	PA20253L	PA20253	20,253	854.00	858.65	4.65	859.23	5.23	77
	PA20968L	PA20968	20,968	855.88	862.18	6.30	862.30	6.42	78
	Calhoun Road (3' RCP)	PA21034	21,034	856.28	863.17	6.89	863.61	7.33	78
Calhoun Road (2' RCP)	PA21314L	PA21314	21,314	857.00	863.21	6.21	863.63	6.63	53
	PA21889L	PA21889	21,889	858.46	863.35	4.89	863.67	5.21	52
	PA21952	PA21952	21,952	858.69	863.49	4.80	863.81	5.12	54
	PA23632L	PA23632	23,632	862.03	868.22	6.19	868.36	6.33	52
	Coffee Road (3' RCP)	PA23672	23,672	862.44	868.38	5.94	868.56	6.12	54
	PA28197L	PA28197	28,197	874.63	877.94	3.31	878.03	3.40	52
	Observatory Road (8.58'x5.92 Arch)	PA28237	28,237	875.10	880.16	5.06	880.59	5.49	51
	PA30147L	PA30147	30,147	879.90	884.31	4.41	884.42	4.52	51
	PA32172L	PA32172	32,172	884.91	887.98	3.07	888.02	3.11	35
	Observatory Road (5.42'x3.33' Arch)	PA32214	32,214	885.25	893.56	8.31	894.10	8.85	11
Observatory Road (2' RCP)	PA32214	PA32214	32,214	893.25	893.56	0.31	894.10	0.85	74
	Tributary AB								
	PAB4480L	PAB4480	44,800	873.94	873.77	1.83	876.25	2.31	66
	Cleveland Avenue (3' RCP)	PAB4611	46,111	876.34	887.52	11.18	888.37	12.03	22
	Cleveland Avenue Overflow	PAB4611	46,111	886.60	887.52	0.92	888.37	1.77	128
	Tributary AC								
	PAC2000L	PAC2000	20,000	874.12	874.89	0.77	874.92	0.80	10
	Cleveland Avenue (5' RCP)	PAC2130	21,300	875.41	882.61	7.20	883.92	8.51	11
	PAC4150L	PAC4150	41,500	892.28	893.33	1.05	893.64	1.36	65
	Willow Road (2.92'x2 Arch)	PAC4194	41,940	892.78	897.55	4.77	897.87	5.09	10

City of New Berlin
Poplar Creek

100 Year/3 Hour Precipitation Event

Conduit		Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase		
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation (ft)	Future Depth (ft)	Future Elevation Increase	Future Flow Increase
Willow Road Overflow	83	144	PAC4194	4194	896.60	897.55	0.95	897.87	1.27	0.32	61
Tributary AD											
PAD0345L	222	261	PAD0345	345	857.70	863.22	5.52	863.64	5.94	0.42	39
PAD2060L	77	94	PAD2060	2060	861.40	863.25	1.85	863.66	2.26	0.41	17
166th Street (3.5'x3.75' Box))	94	113	PAD2113	2113	861.47	863.27	1.80	863.67	2.20	0.40	20
Tributary AE											
PAE0335	247	279	PAE0335	335	859.01	863.25	4.24	863.66	4.65	0.41	32
Victor Road (3.4.88'x3' Arch)	250	287	PAE0384	384	859.53	863.49	3.96	864.20	4.67	0.71	37
Victor Road Overflow	0	1	PAE0384	384	864.10	863.49	-0.61	864.20	0.10	0.71	1
PAE1379	164	199	PAE1379	1379	861.71	864.61	2.90	864.88	3.17	0.27	35
Ryerson Drive (2.4.75'x3.17 Arch)	174	208	PAE1423	1423	862.22	865.15	2.93	865.80	3.58	0.65	34
Tributary B											
PB0390L	87	99	PB0390	390	827.04	830.07	3.03	830.23	3.19	0.16	11
C & NW Railroad (4' RCP)	139	115	NORTHRR	440	827.20	830.07	2.87	830.23	3.03	0.16	(24)
Tributary C											
PCI1595L	140	167	PCI1595	1595	829.41	830.07	0.66	830.23	0.82	0.16	27
PCGRVL2 (1.75' RCP)	23	27	PCI1615	1615	829.88	834.17	4.29	834.20	4.32	0.03	5
PCGRVL2R	29	34	PCI1615	1615	833.90	834.17	0.27	834.20	0.30	0.03	5
PC2205L	106	117	PC2205	2205	831.95	834.17	2.22	834.20	2.25	0.03	11
Lincoln Avenue (2'x1.5' Arch)	28	29	PC2254	2254	833.32	839.13	5.81	839.20	5.88	0.07	0
Lincoln Avenue Overflow	93	105	PC2254	2254	838.10	839.13	1.03	839.20	1.10	0.07	12
PC5034L	141	154	PC5034	5034	840.80	842.69	1.89	842.76	1.96	0.07	13
PC7729L	135	148	PC7729	7729	847.98	849.12	1.14	849.17	1.19	0.05	13
Cleveland Avenue (7.25'x5.25' Arch)	137	150	PC7818	7818	848.95	852.06	3.11	852.25	3.30	0.19	13
PCI10533L	227	353	PCI10533	10533	884.20	884.87	0.67	885.01	0.81	0.14	126
PCI12423L	40	50	PCI12423	12423	910.00	910.67	0.67	910.70	0.70	0.03	9

City of New Berlin
Underwood Creek
2 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Elevation Increase	Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth		
Meadow Lane (4'x14' Box)	112	112	U00000	0	751.95	752.71	0.76	752.71	0.76	0.00	0
Meadow Lane (4'x9' Box)	89	97	U01385	1,385	756.88	759.42	2.54	759.58	2.70	0.16	8
CHAN3	57	69	U03025	3,025	777.24	779.08	1.84	779.21	1.97	0.13	12
Elm Grove Road (3.92'x5.92' Arch)	60	74	U03065	3,065	778.24	779.17	0.93	779.28	1.04	0.11	13
CHAN2	42	49	U03815	3,815	787.06	788.69	1.63	788.79	1.73	0.10	8
Arcadian Drive (3.92'x5.92' Arch)	46	54	U03847	3,847	787.49	788.83	1.34	788.96	1.47	0.13	8
CHAN1B	23	28	U04847	4,847	802.40	803.87	1.47	803.98	1.58	0.11	5
CHAN1A	23	28	U06047	6,047	821.40	822.15	0.75	822.22	0.82	0.07	5
Greenfield Avenue (5' RCP)	30	49	U06781	6,781	828.21	830.59	2.38	831.42	3.21	0.83	20
Greenfield Avenue (5' RCP)	23	28	U06701	6,701	828.00	830.09	2.09	830.33	2.33	0.24	5

10 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions			
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth	Future Elevation Increase	Future Flow Increase
Meadow Lane (4'x14' Box)	140	148	U00000	0	751.95	752.71	0.76	752.72	0.77	0.01	8
Meadow Lane (4'x9' Box)	140	148	U01385	1,385	756.88	760.35	3.47	760.77	3.89	0.42	8
CHAN3	102	113	U03025	3,025	777.24	779.54	2.30	779.64	2.40	0.10	11
Elm Grove Road (3.92'x5.92' Arch)	103	117	U03065	3,065	778.24	779.49	1.25	779.59	1.35	0.10	14
CHAN2	85	94	U03815	3,815	787.06	789.12	2.06	789.17	2.11	0.05	10
Arcadian Drive (3.92'x5.92' Arch)	85	94	U03847	3,847	787.49	789.46	1.97	789.66	2.17	0.20	10
CHAN1B	57	64	U04847	4,847	802.40	804.21	1.81	804.25	1.85	0.04	7
CHAN1A	57	65	U06047	6,047	821.40	822.67	1.27	822.77	1.37	0.10	7
Greenfield Avenue (5' RCP)	47	81	U06781	6,781	828.21	831.44	3.23	832.61	4.40	1.17	34
Greenfield Avenue (5' RCP)	57	65	U06701	6,701	828.00	831.44	3.44	831.70	3.70	0.26	7

City of New Berlin
Underwood Creek
25 Year/3 Hour Precipitation Event

Conduit			Upstream Junction			Existing Conditions		Future Conditions		Future Flow Increase
Name	Existing Flow (CFS)	Future Flow (CFS)	Junction ID	Station (ft)	Invert Elevation	Calculated Water Surface Elevation (ft)	Existing Depth (ft)	Calculated Water Surface Elevation	Future Depth	Future Elevation Increase
Meadow Lane (4'x14' Box)	171	173	U00000	0	751.95	752.79	0.84	752.80	0.85	0.01
Meadow Lane Overflow	13	30	U01385	1,385	763.00	763.41	0.41	763.66	0.66	0.25
Meadow Lane (4'x9' Box)	171	173	U01385	1,385	756.88	763.41	6.53	763.66	6.78	0.25
CHAN3	149	161	U03025	3,025	777.24	779.78	2.54	779.82	2.58	0.04
Elm Grove Road (3.92'x5.92' Arch)	150	161	U03065	3,065	778.24	779.81	1.57	779.88	1.64	0.07
CHAN2	124	134	U03815	3,815	787.06	789.30	2.24	789.34	2.28	0.04
Arcadian Drive (3.92'x5.92' Arch)	124	134	U03847	3,847	787.49	790.42	2.93	790.65	3.16	0.23
CHAN1B	83	90	U04847	4,847	802.40	804.46	2.06	804.53	2.13	0.07
CHAN1A	83	90	U06047	6,047	821.40	823.01	1.61	823.10	1.70	0.09
Greenfield Avenue (5' RCP)	61	104	U06781	6,781	828.21	832.41	4.20	833.95	5.74	1.54
Greenfield Avenue (5' RCP)	83	90	U06701	6,701	828.00	832.40	4.40	832.70	4.70	0.30

SUMMARY REPORT ON AN EVALUATION OF THE WETLANDS
OF THE CITY OF NEW BERLIN, WAUKESHA COUNTY, WISCONSIN,
FOR THEIR POTENTIAL FOR STORM WATER DETENTION
AND SURFACE WATER QUALITY IMPROVEMENT

December 1997

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Introduction

Two well-documented functional values of wetlands are their capacity to detain surges of storm water runoff, and their ability to remove sediment and nutrients from surface water. The large storage capacity and controlled outflow of many wetlands detains storm water and releases it slowly following a storm event, thereby dampening both extreme peak flows, and the low flows associated with prolonged dry periods. The long detention time of water in wetlands, the complex flow patterns developed by the structure of the wetland vegetation, and nutrient uptake by wetland plants, combine to make many wetlands very effective for removal and storage of sediment and for the removal and transformation of some dissolved nutrients from surface waters. The wetlands of the City of New Berlin were evaluated both for their existing capacity to contribute to storm water management, and for their potential to provide additional benefits with modification or restoration.

When New Berlin was surveyed in the 1830's (before extensive settlement), most of the upland area of the city was covered with an almost unbroken forest dominated by sugar maple, basswood, red oak, white oak, and black oak. The City of New Berlin is just north and east of the boundary of some of Wisconsin's "fire maintained" plant communities such as oak forest, oak openings, and prairie. The large wetlands in the northwestern and west central parts of New Berlin were depicted as open wetlands of marsh, sedge meadow, and wet prairie on the map of the "Original Vegetation Cover of Wisconsin" (Finley 1976). These wetlands were probably maintained in an open, treeless, condition by fires which swept into the wetlands from the oak openings in adjacent Waukesha. Smaller, more isolated, wetlands and wetlands further east in New Berlin were probably

forested, supporting cedar-tamarack conifer swamp, hardwood swamp, or floodplain forest, although these areas were not large enough to be mapped (Finley 1976). All of the wetlands of New Berlin have been disturbed since settlement, most of them severely disturbed. I found only one conifer swamp (white cedar and tamarack) remaining in the city, and only very small and isolated areas having even moderate quality sedge meadows. Unlike the wildlife habitat functions of wetlands, the ability of wetlands to improve quality and flow characteristics of surface water is not negatively affected by the replacement of native vegetation with the plant communities which typically colonize after severe disturbance. Most of New Berlin's wetlands have been ditched, and many have been tilled, however, which does seriously reduce their ability to provide water quality functional values.

Methods

There are two conceptual measures, "Effectiveness" and "Opportunity", which are useful for evaluating the potential water quality and water detention values of wetlands. These concepts, and a methodology for evaluating wetland functions are developed in: Adamus, P.R., Clairain, E.J., Jr., Smith, R.D., and Young, R.E. 1987. "Wetland Evaluation Technique (WET); Volume II: Methodology, " Operational Draft Technical Report Y-87-__, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. Effectiveness assesses the capability of a wetland to perform a function based on the features of the wetland itself. For the storm water detention and water quality functions of interest to this project these features are primarily the physical characteristics of the wetland such as size, slope, and the physical traits of the inlet and outlet. Effectiveness does not evaluate the current opportunity for the wetland to perform the function, which with respect to flow and quality functions is based on the delivery of runoff, sediment, and nutrient loading to the wetland. Opportunity assesses the opportunity that a wetland has to perform a function. For example, a wetland may possess the physical attributes required to perform flood flow alteration, but if the wetland is positioned in the watershed where it will not receive much runoff, it will not have the opportunity to perform a storm water detention function.

With respect to development of a storm water management plan for New Berlin both effectiveness and opportunity are important measures of value of a wetland area, however both of these functional features can change over time with changes in land use or with intentional changes to the wetland characteristics. For planning purposes the effectiveness of the wetland based on physical traits may be more important than the opportunity based on watershed characteristics. The loading of runoff, sediment, and nutrients to a specific wetland will change as the land use surrounding the wetland changes. For planning storm water management it may, therefore, be more important to evaluate the potential effectiveness of the wetland to perform desirable water quality functions, than it is to assess the current opportunity for that function. If a wetland area has a tremendous capacity, ie. effectiveness, to perform a function, in many cases the opportunity can be provided through the planning and design process.

I attempted to locate and roughly map the boundaries of all wetlands over two acres in area in the City of New Berlin using the following materials: 1) 1" = 100' scale, 2' contour interval, topographic maps. These maps had sub-basin or hydrologic unit boundaries delineated. 2) 1995 SEWRPC aerial photographs covering the entire area. 3) DNR, 1986, Final Wetland Inventory Maps for New Berlin. 4) NRCS Draft Wetland Inventory Maps showing an estimate of the boundaries of wetland, farmed wetland, and prior-converted wetland areas. Nearly every area determined to be wetland using these materials was field inspected (at least from the nearest roadway), and in the process I drove every rural roadway in the City of New Berlin. Over half of all of the identified

To obtain a standardized scoring or ranking for describing the relative water quality and flood alteration values of wetlands in the project area, wetlands were rated from none = 0, low = 1, to very high = 6, for 1) existing capacity or effectiveness, 2) existing opportunity, and 3) potential to add capacity or effectiveness with modification or restoration. These scores or rankings can be multiplied by the area of each wetland to obtain an index of total relative value or potential of the wetland. Any wetland area having a high or very high additional potential is an excellent candidate for more thorough study as a restoration site if it is located in an area where storm water could be delivered, or where additional capacity would be desirable.

Although the primary focus of this study was storm water management potential, wetlands having exceptionally high value for wildlife, native vegetation, or recreational opportunities were noted. These wetlands were field inspected to a limited extent to confirm their suspected high natural area value.

Summary of Results

The basic results of the study are presented in tabular format showing the summary evaluation of each identified wetland area. A key to the codes and abbreviations used in the table is as follows:

- HU = Hydrologic Unit (or sub-basin) identification number;
- Wet. No. = An identifying number assigned to each wetland;
- Wetl. Area = Area (acres) of the individual wetlands in the hydrologic unit;
- Sec = Section(s);
- 1/4 = Quarter section(s);
- E/PC = Majority of the identified area is an Existing wetland, or is Prior Converted wetland no longer identified as wetland on the wetland inventory maps:
 - 0 = prior converted,
 - 1 = existing wetland;
- Veg = General vegetation types:
 - FRM = farmed,
 - PND = constructed pond,
 - E1K = Emergent/wet meadow, perennial vegetation on wet soil,
 - E2K = Emergent/wet meadow, perennial narrow-leaved (eg. cattail) on wet soil,
 - E2H = Emergent/wet meadow, perennial narrow-leaved (eg. cattail) in standing water,
 - S3K = Shrub vegetation on wet soil,
 - S3H = Shrub vegetation in standing water,
 - T2K = Needle-leaved deciduous (ie. tamarack) swamp forest,
 - T3K = Broad-leaved deciduous swamp forest;
- Src = Source of sediment and nutrient loading:
 - N = none,
 - F = farm,
 - R = residential,
 - H = highway,
 - I = industrial or commercial;

Cst = Surface water outlet constriction:

- O = none,
- D = depressional wetland, no outlet,
- N = natural constriction,
- C = culvert or bridge;

Dth = Wetland substantially impacted by presence of a ditch or outlet alteration:

- 0 = no,
- 1 = yes;

Slp = Average slope of the wetland surface (feet/0.25 miles):

- 1 = 30'/0.25 miles,
- 2 = 25',
- 3 = 20',
- 4 = 15',
- 5 = 10',
- 6 = 7.5',
- 7 = 5',
- 8 = 2.5'/0.25 miles,
- 9 = flat;

Val = Current value (ie. effectiveness, or capacity):

- 0 = none,
- 1 = low,
- 2 = low to moderate,
- 3 = moderate,
- 4 = moderate to high,
- 5 = high,
- 6 = very high;

Add Pot = Potential for additional effectiveness (same scale as current value);

Imp = Possible methods for improvement of effectiveness:

- C = control outflow,
- D = ditch modification (filling or rerouting),
- S = slope changes;

Opp = Current opportunity (same scale as current value);

Val Acres = Acreage with a current value (effectiveness) of moderately-high or higher;

Pot Acres = Acreage with a potential for additional effectiveness that is moderately-high or higher.

This study identified 82 wetland areas, totaling 2,800 acres, in the City of New Berlin, including existing wetlands and prior converted wetlands with potential for restoration of surface water improvement functional values. The area of New Berlin is approximately 36.75 mi² (23,500 acres) so the existing or restorable wetland is at least 12% of the land area of the City. The quality of existing wetlands for surface water improvement is variable; approximately 1,145 acres (41% of studied wetland area) have at least moderately high value for surface water quality and flow improvement. 1,980 acres (71% of the total acreage) have at least moderately high additional potential for surface water improvement. Most of this area with high potential is prior converted wetland and most of it has been ditched. Prior converted wetlands comprise 30 (37%) of the 82 wetland areas. Prior converted wetlands tend to be some of the larger wetland acreages, so these 30 prior converted wetland areas occupy 1,590 acres, or 57% of the summarized wetland area. Ditching has had a substantial impact on the hydrology of 61 (74%) of the 82 wetlands of New Berlin.

The existing wetlands are not distributed uniformly across the City of New Berlin. The most intensively developed areas of the City have the lowest remaining acreage of wetland because of historical drainage and filling of wetlands in the developed areas. There is a strong negative correlation between the current estimated value, or effectiveness, for surface water improvement and the estimated potential for added value with restoration or modification. Most wetlands that already have high functional value possess little additional potential, and conversely, most wetlands with little current value have high additional potential. The part of New Berlin with the highest potential for the use of wetlands for storm water management is the northwest part of the City. Of the 2,800 total wetland acres inventoried in New Berlin, 1982 acres (71% of the total) are in the Poplar River watershed. Most of this land is in extensive prior converted wetlands along the drainage ditches which form the current waterways. In general there is a tremendous capacity to utilize wetlands for storm water management in the City of New Berlin.

All of the wetlands I inspected in the City of New Berlin were disturbed, most of them severely. I found only one conifer swamp despite the fact that this was probably one of the most common wetland vegetation types in the city before settlement and extensive disturbance of wetlands. Only very small areas of natural sedge meadow were found remaining in the city.

WATERSHED	HU	Wet. Wetl.		Sec	1/4	E/ PC Veg	Src	Cst	Dth	Slp	Val	Add		Imp	Opp	Acres	Pot Acres	
		No.	Area									Pot	Imp					
Underwood	1A010																0	0
Underwood	1A020																0	0
Underwood	1A030																0	0
Underwood	1A031																0	0
Underwood	1A032																0	0
Total acres			0															
Upper Root	2A010																0	0
Upper Root	2A020																0	0
Upper Root	2A030																0	0
Upper Root	2A040																0	0
Upper Root	2A050																0	0
Upper Root	2A060																0	0
Upper Root	2B010																0	0
Upper Root	2B015																0	0
Upper Root	2B020																0	0
Upper Root	2B030																0	0
Upper Root	2B040	11-1	4.5	11	SE	1 E2H	R	N	0	9	6	1		6		4.5	0	0
Upper Root	2B050	14-1	1.8	14	NE	1 E2K	R	N	0	8	5	2		5		1.8	0	0
Upper Root	2B060																0	0
Upper Root	2C010																0	0
Upper Root	2D010																0	0
Upper Root	2D020																0	0
Upper Root	2D030																0	0
Upper Root	2D040																0	0
Upper Root	2E010																0	0
Upper Root	2E011																0	0
Upper Root	2E020																0	0
Upper Root	2E030																0	0
Upper Root	2E040																0	0
Upper Root	2E050																0	0
Upper Root	2E060																0	0
Upper Root	2E070	36-1	3.6	36	NE	1 E1K	R	C	0	9	6	1		6		3.6	0	0
		36-2	6.9	36	NE	1 E1K	R	C	0	9	6	1		6		6.9	0	0
Upper Root	2E071																0	0
Upper Root	2E080																0	0
Upper Root	2E090	36-3	12	36	NE	1 E1K/T3K/S3K	R	C	0	9	6	1		6		12	0	0
		36-4	8.8	36	NW	1 E2H	R	N	0	9	5	2		5		8.8	0	0
Upper Root	2F010																0	0
Total acres			37.6															
Deer Creek	3A010	2-1	3.6	2	NW	1 E2K/S3K/T3K	R	N	0	8	5	1		4		3.6	0	0
		2-2	2.7	2	NW	1 E2K	RHI	C	0	2	4	3	CS	5		2.7	0	0
		3-1	25.2	3	NE	1 E2K/S3K/T3K	R	O	0	7	5	1		6		25.2	0	0
		3-2	7.1	3	NW	1 E2K/S3K/T3K	R	O	0	7	4	2		6		7.1	0	0
Deer Creek	3A011																0	0
Deer Creek	3A020																0	0
Deer Creek	3A030																0	0
Deer Creek	3A031																0	0
Deer Creek	3A032																0	0
Deer Creek	3A033	3-3	11.7	3	SE,SW	1 E2K/S3K	RI	C	1	7	4	3	C	6		11.7	0	0
Deer Creek	3A040	11-2	13	11	SW	1 S3K/T3K	R	C	1	6	5	3	D	5		13	0	0
Deer Creek	3A041																0	0
Deer Creek	3A042																0	0
Deer Creek	3A043																0	0
Deer Creek	3A044																0	0
Deer Creek	3A050	14-3	16.5	14	SW	1 E1K/T3K	RI	O	1	6	3	5	DC	5		0	16.5	0
Deer Creek	3A060	14-2	52.9	14	SE,SW	0 FRM	RIF	O	1	5	1	6	DC	5		0	52.9	0
Deer Creek	3A070	23-2	39.3	23	NE,NW	0 FRM	RIF	O	1	5	1	6	DC	5		0	39.3	0
Deer Creek	3A080																0	0
Total area			172															

WATERSHED	HU	Wet. No.	Wetl. Area	Sec	1/4	E/ PC Veg	Src	Cst	Dth	Slp	Val	Add Pot	Imp	Opp	Val Acres	Pot Acres
Calhoun	4A010	21-4	8.2	21	SE	0 FRM	FR	C	1	9	1	6 DC	5		0	8.2
Calhoun	4A020														0	0
Calhoun	4A030														0	0
Calhoun	4B010														0	0
Calhoun	4B020														0	0
Calhoun	4C010	23-1	3.7	23	SW	1 T3K/S3K	R	N	0	7	5	0	5		3.7	0
		27-1	43.7	27	NE, NW	1 S3K/E2K	FR	N	1	5	5	3 D	4		43.7	0
		27-2	9.7	27	NW	0 FRM	FR	O	1	6	1	4 DS	4		0	9.7
Calhoun	4C020	27-4	11.6	27	NE	0 FRM	HFR	C	1	8	0	6 DCS	6		0	11.6
Calhoun	4C030	26-1	12.2	26	NW, SW	0 E2K/E2H/FRM	HI	C	1	8	3	6 DC	6		0	12.2
		26-2	5.6	26	SW	1 E1K	HI	C	0	8	3	5 C	5		0	5.6
Calhoun	4C040	27-3	24.1	27	SE	0 FRM	HFR	N	1	9	0	6 CDS	6		0	24.1
Calhoun	4C050	28-1	10.8	28	SE	0 FRM	RF	C	1	5	0	4 CDS	6		0	10.8
Calhoun	4C060	33-1	25.4	33	NE	0 FRM	HFR	O	1	8	0	6 DCS	6		0	25.4
Calhoun	4C070	33-2	50	33	NE, SW	1 E1K/T3K/FRM	HFR	N	1	8	5	3 D	6		50	0
Calhoun	4C080	32-1	29.8	32/33	SE/SW	1 E2H/E2K	HR	NC	0	8	6	1	6		29.8	0
Calhoun	4C085														0	0
Calhoun	4C090	32-2	7.6	32	SE	1 E2K	R	NC	0	9	6	1	5		7.6	0
Calhoun	4D010														0	0
Calhoun	4E010														0	0
Calhoun	4E020														0	0
Calhoun	4E030														0	0
Calhoun	4E040														0	0
Calhoun	4E050														0	0
Calhoun	4E060														0	0
Calhoun	4F010														0	0

Total area 242.4

Tess Cnrs	5A010	26-3	3.8	26	SW	1 S3K/T3K	R	C	1	6	4	3 DC	4		3.8	0
		26-4	14.8	26	SE	1 S3K/T3K/E1K	R	N	1	6	4	4 DC	4		14.8	14.8
Tess Cnrs	5A020	34-1	18.1	34	NE, SE	1 E1K/T3K	FR	O	1	7	4	4 DC	3		18.1	18.1
		34-2	30.4	34/35	SE/SW	0 FRM	FR	O	1	7	3	5 DCS	3		0	30.4
		35-1	10.4	35	NW	0 FRM	FR	O	1	7	0	6 DC	4		0	10.4
		35-2	22.6	35	SE	0 FRM	FR	N	1	9	0	6 DC	4		0	22.6
		36-5	6.3	36	NW	1 E2H	F	N	0	7	5	2 C	3		6.3	0
		36-6	10.5	36	NW	1 S3K	F	N	0	7	5	2 C	3		10.5	0

Tess Cnrs 5A030

Total area 116.9

Poplar	6A010	8-1	137.8	8/9	NE, SE/NW, SW	0 FRM/S3K/T3K	F	O	1	6	2	5 DC	3		0	137.8
		8-2	52	8	NE, NW	1 S3K/E2K/T3K	F	O	1	6	4	3 D	3		52	0
		8-3	11.8	8	SW	1 E2K/FRM	F	C	0	4	3	5 CS	3		0	11.8
Poplar	6A011	8-4	3.3	8	SE	1 T3K/S3K	R	NC	0	4	4	2	4		3.3	0
Poplar	6A020	9-1	62	8/9	NE/NE, NW, SE, SW	1 S3K/T3K	RFI	O	0	7	5	1	4		62	0
Poplar	6A021	9-2	6.6	9	NW	1 E2K	FI	O	1	4	4	4 DC	3		6.6	6.6
Poplar	6A022	9-3	9.3	9	SW	0 E2K/FRM	RI	C	1	7	3	5 DC	5		0	9.3
Poplar	6A023	17-2	50.7	8/17/16	SE/NE/NW	1 E2K/S3K	FR	O	1	7	4	3 D	4		50.7	0
Poplar	6A030														0	0
Poplar	6A040														0	0
Poplar	6A041	15-2	95.4	15	NW	0 FRM/E1K	IR	O	1	8	4	5 DC	5		95.4	95.4
		15-4	22.1	15	SW	0 FRM	FR	O	1	7	3	5 DCS	4		0	22.1
Poplar	6A042	15-1	8.8	15	NE/NW	1 T3K/E1K	RI	O	1	5	3	5 DC	6		0	8.8
Poplar	6A043														0	0
Poplar	6A044														0	0
Poplar	6A050														0	0
Poplar	6A060	15-3	95.3	15/16	SW/SE	0 FRM	FR	O	1	8	2	5 D	4		0	95.3
		16-1	17.4	16	SE	1 T3K	FR	O	1	8	4	4 D	4		17.4	17.4
Poplar	6A070	21-2	5.8	21	NW	1 E1K/S3K	FR	O	1	7	4	4 DC	4		5.8	5.8
Poplar	6A071	16-2	140.9	16/17/21/20	SW/SE/NW/NE	0 FRM	F	O	1	7	1	5 D	4		0	140.9
		17-1	25.5	17	SE	1 E1K/S3K	F	O	1	7	3	5 D	4		0	25.5
		20-1	20.3	20	NE, NW	1 E2K/S3K	F	N	1	8	4	3 D	3		20.3	0
		20-2	4.5	20	NW	1 E1K	FR	N	1	9	5	3 D	4		4.5	0

WATERSHED	HU	Wet. Wetl.		Sec	1/4	E/ PC Veg	Src	Cst	Dth	Slp	Val	Add			Opp	Val Acres	Pot Acres
		No.	Area									Pot	Imp	Val			
Poplar	6A072	21-1	5	21	NW	1 E1K	FR	N	1	7	3	4	DC	4	0	5	
		20-3	166.5	20/21	SE/SW, SE, NW	1 T3K/S3K/E2K	F	N	1	8	4	5	D	3	166.5	166.5	
		21-3	70.3	21	SW	0 FRM	F	N	1	8	2	5	D	3	0	70.3	
Poplar	6B010	6-5	87.2	6	SE, SW	1 E1K/T3K	F	O	1	4	5	2	D	3	87.2	0	
		6-6	11.9	6	SW	0 FRM	F	O	1	7	2	5	D	3	0	11.9	
		7-2	86	7	NE, NW	0 FRM/E1K/S3K	F	O	1	5	3	5	D	3	0	86	
Poplar	6B020														0	0	
Poplar	6B030														0	0	
Poplar	6B040	7-4	41.3	7	SE, SW	1 E2K/S3K/T3K	FR	O	1	5	4	3	DC	3	41.3	0	
Poplar	6B050	7-3	55.2	7	NE, SE	1 E2K/S3K/E1K	F	O	1	9	6	2	D	3	55.2	0	
Poplar	6C010	5-2	44.3	5	NE, NW	0 FRM/PND	RF	O	1	8	2	5	DC	4	0	44.3	
		5-3	196.9	5	SE, SW	0 FRM/E1K/S3K	FI	O	1	8	1	5	D	3	0	196.9	
		6-4	65.7	6	SE, SW	1 E1K/S3K/T3K	F	O	1	6	3	4	D	3	0	65.7	
		6-7	5.3	6	SE	1 E1K	FI	C	1	9	2	5	DC	3	0	5.3	
		6-8	5.5	6	SE	1 E1K	FI	C	1	9	2	5	DC	3	0	5.5	
Poplar		6C020	7-1	5.3	7	NE	0 FRM	F	C	1	8	0	6	DC	3	0	5.3
			4-1	83.8	4	NE, NW	0 FRM	FR	O	1	8	0	6	D	2	0	83.8
			4-3	135	4/5	SW/SE	0 FRM	F	O	1	8	0	6	D	2	0	135
Poplar	6C021	5-1	35.8	5	NE	0 FRM/T2K/S3K	RF	O	1	8	3	5	DC	5	0	35.8	
		4-2	8.2	4	NE	1 T3K	R	O	1	5	3	5	DC	5	0	8.2	
		4-4	4.1	4	NE	1 T3K/S3K	R	N	0	3	2	4	CS	5	0	4.1	
Poplar	6D010	4-5	35.7	4	NW	0 FRM	F	O	1	8	0	6	D	3	0	35.7	
		6-2	24.1	6	NE, NW	1 E2K/S3K	R	O	1	8	4	3	D	4	24.1	0	
		6-3	5.3	6	NW	1 E2K	R	N	1	9	5	3	D	4	5.3	0	
Poplar	6D020	6-1	34.5	6	NE, NW	1 E2K/S3K	R	O	1	8	4	3	D	4	34.5	0	
Poplar	6E010														0	0	
Poplar	6F010														0	0	
Total area			1982														
Mill Creek	7A010														0	0	
Mill Creek	7B010	19-1	12.3	19	NW	1 T3K/S3K	F	D	0	9	5	0		3	12.3	0	
Mill Creek	7B020														0	0	
Mill Creek	7B030	29-1	53.3	29	NW	0 FRM/S3K/E1K	FR	O	1	8	3	5	DC	4	0	53.3	
		30-1	72.2	30	NE	0 FRM	FR	O	1	8	0	6	DC	4	0	72.2	
		30-2	70.3	30	NW, SE, SW	1 E1K/S3K/T3K	F	N	1	8	5	3	D	3	70.3	0	
		30-3	41.2	30	NW, SW	1 E1K/S3K	F	C	1	8	6	1		3	41.2	0	
Mill Creek	7B040														0	0	
Mill Creek	7C010														0	0	
Mill Creek	7D010														0	0	
Total area			249.3														
Total area all watersheds			2800														

APPENDIX D

Water Quality Model Results

Appendix ____
City of New Berlin - Stormwater Management Study
Unit Area Pollutant Loading Rates

Land Use Types	Unit Area Loading Rates				
	Sediment (lb./ac./yr.)	Phosphorous (lb./ac./yr.)	Lead (lb./ac./yr.)	Copper (lb./ac./yr.)	Zinc (lb./ac./yr.)
Wetland, Forest, Preservation	3	0.03	0.010	0.010	0.010
Agriculture	450	0.86	0.010	0.010	0.010
Park	417	2.81	0.010	0.010	0.060
Institutional	421	1.80	0.184	0.080	1.090
Low Density Residential	205	0.19	0.128	0.056	0.080
Medium Density Residential	410	0.38	0.256	0.112	0.160
High Density Residential	574	0.52	0.360	0.160	0.224
Commercial	1056	1.07	2.700	0.400	2.100
Industrial	430	0.14	1.200	0.250	3.650
Highway	1003	2.20	5.730	0.620	2.600
Arterial	288	1.12	0.560	0.150	0.560
Open Water	185	0.13	0.040	0.040	0.040
Extractive, Landfill	3344	0.09	0.010	0.010	0.010
Railroad	540	0.44	0.420	0.000	2.000

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Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses		Total Loadings							
			Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc	
			(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	
Calhoun Creek 4A010 Area 125.3	Wetland, Forest, Preservation		25.00	31.24	93.71	0.94	0.31	0.31	0.31	
	Agriculture		50.00	60.86	27387.00	52.34	0.61	0.61	0.61	
	Park		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Institutional		5.00	6.18	2599.68	11.12	1.14	0.49	6.73	
	Low Density Residential		20.00	24.46	5014.30	4.70	3.13	1.37	1.96	
	Medium Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Industrial		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial		0.00	2.57	740.16	2.88	1.44	0.39	1.44	
	Open Water		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal		100.00	125.30	35834.84	71.97	6.63	3.17	11.05	
	Calhoun Creek 4A020 Area 180.3	Wetland, Forest, Preservation		15.00	26.50	79.49	0.79	0.26	0.26	0.26
		Agriculture		60.00	106.32	47844.00	91.44	1.06	1.06	1.06
		Park		10.00	18.03	7518.51	50.66	0.18	0.18	1.08
	Institutional		5.00	8.74	3677.44	15.72	1.61	0.70	9.52	
	Low Density Residential		5.00	8.57	1755.83	1.64	1.10	0.48	0.69	
	Medium Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial		5.00	9.02	9519.84	9.65	24.34	3.61	18.93	
	Industrial		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial		0.00	3.14	904.32	3.52	1.76	0.47	1.76	
	Open Water		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal		100.00	180.30	71299.42	173.42	30.31	6.76	33.31	
	Calhoun Creek 4A030 Area 88.2	Wetland, Forest, Preservation		5.00	4.37	13.11	0.13	0.04	0.04	0.04
		Agriculture		40.00	34.65	15592.50	29.80	0.35	0.35	0.35
		Park		0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Low Density Residential		55.00	48.07	9854.35	9.23	6.15	2.69	3.85	
	Medium Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Industrial		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial		0.00	1.11	319.68	1.24	0.62	0.17	0.62	
	Open Water		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal		100.00	88.20	25779.64	40.40	7.16	3.25	4.86	

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4B010 Area 250.5	Wetland, Forest, Preservation	5.00	12.53	37.58	0.38	0.13	0.13	0.13
	Agriculture	42.00	104.43	46993.50	89.81	1.04	1.04	1.04
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	12.34	5193.04	22.20	2.27	0.99	13.45
	Low Density Residential	42.00	103.73	21264.65	19.92	13.28	5.81	8.30
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4.00	9.83	10380.48	10.52	26.54	3.93	20.64
	Industrial	1.00	2.51	1077.15	0.35	3.01	0.63	9.14
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.64	760.32	2.96	1.48	0.40	1.48
	Open Water	1.00	2.51	463.43	0.33	0.10	0.10	0.10
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	250.50	86170.14	146.46	47.84	13.02	54.28
Calhoun Creek 4B020 Area 224.9	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	33.00	74.22	33397.65	63.83	0.74	0.74	0.74
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	64.00	143.11	29336.73	27.48	18.32	8.01	11.45
	Medium Density Residential	1.00	2.25	922.09	0.85	0.58	0.25	0.36
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	2.00	4.50	4511.49	9.90	25.77	2.79	11.69
	Arterial	0.00	0.83	239.04	0.93	0.46	0.12	0.46
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	224.90	68407.00	102.97	45.87	11.92	24.71
Calhoun Creek 4C010 Area 756.5	Wetland, Forest, Preservation	20.00	151.23	453.69	4.54	1.51	1.51	1.51
	Agriculture	20.00	149.29	67180.50	128.39	1.49	1.49	1.49
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	22.66	9537.76	40.78	4.17	1.81	24.69
	Low Density Residential	20.00	149.79	30706.95	28.76	19.17	8.39	11.98
	Medium Density Residential	30.00	226.95	93049.50	85.33	58.10	25.42	36.31
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	15.05	15892.80	16.10	40.64	6.02	31.61
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	37.83	37938.48	83.22	216.74	23.45	98.35
	Arterial	0.00	3.71	1068.48	4.16	2.08	0.56	2.08
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	756.50	255828.15	391.27	343.90	68.65	208.02
Calhoun Creek 4C020 Area 74	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	73.00	52.41	23584.50	45.07	0.52	0.52	0.52
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	15.00	10.79	4423.90	4.06	2.76	1.21	1.73
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	2.00	1.48	636.40	0.21	1.78	0.37	5.40
	Highway	10.00	7.40	7422.20	16.28	42.40	4.59	19.24
	Arterial	0.00	1.92	552.96	2.15	1.08	0.29	1.08
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	74.00	36619.96	67.77	48.54	6.98	27.97
Calhoun Creek 4C030 Area 345.9	Wetland, Forest, Preservation	42.00	144.52	433.55	4.34	1.45	1.45	1.45
	Agriculture	27.00	90.02	40510.35	77.42	0.90	0.90	0.90
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	33.37	6840.85	6.41	4.27	1.87	2.67
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4.00	13.84	14610.82	14.80	37.36	5.53	29.06
	Industrial	2.00	6.82	2931.74	0.95	8.18	1.70	24.89
	Highway	15.00	51.45	51599.34	113.18	294.78	31.90	133.76
	Arterial	0.00	5.89	1696.32	6.60	3.30	0.88	3.30
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	345.90	118622.97	223.70	350.23	44.23	196.01

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4C040 Area 224.1	Wetland, Forest, Preservation	25.00	56.03	168.08	1.68	0.56	0.56	0.56
	Agriculture	50.00	111.22	50049.00	95.65	1.11	1.11	1.11
	Park	10.00	22.05	9194.85	61.96	0.22	0.22	1.32
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	10.61	2174.03	2.04	1.36	0.59	0.85
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	3.00	6.61	2843.59	0.93	7.94	1.65	24.14
	Highway	5.00	11.21	11238.62	24.65	64.20	6.95	29.13
	Arterial	0.00	1.90	547.20	2.13	1.06	0.29	1.06
	Open Water	2.00	4.48	829.17	0.58	0.18	0.18	0.18
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	224.10	77044.53	189.61	76.63	11.55	58.36
Calhoun Creek 4C050 Area 84	Wetland, Forest, Preservation	5.00	4.20	12.60	0.13	0.04	0.04	0.04
	Agriculture	35.00	28.90	13005.00	24.85	0.29	0.29	0.29
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	60.00	50.40	10332.00	9.68	6.45	2.82	4.03
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.50	144.00	0.56	0.28	0.08	0.28
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	84.00	23493.60	35.22	7.06	3.23	4.64
Calhoun Creek 4C060 Area 148	Wetland, Forest, Preservation	20.00	29.60	88.80	0.89	0.30	0.30	0.30
	Agriculture	43.00	63.14	28413.00	54.30	0.63	0.63	0.63
	Park	2.00	2.94	1225.98	8.26	0.03	0.03	0.18
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	14.00	20.62	4227.10	3.96	2.64	1.15	1.65
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	2.92	3083.52	3.12	7.88	1.17	6.13
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	14.00	20.55	20611.65	45.21	117.75	12.74	53.43
	Arterial	0.00	0.83	239.04	0.93	0.46	0.12	0.46
	Open Water	5.00	7.40	1369.00	0.96	0.30	0.30	0.30
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	148.00	59258.09	117.63	129.99	16.44	63.08
Calhoun Creek 4C070 Area 408.9	Wetland, Forest, Preservation	32.00	130.85	392.54	3.93	1.31	1.31	1.31
	Agriculture	34.00	137.24	61756.20	118.02	1.37	1.37	1.37
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	8.06	3392.42	14.50	1.48	0.64	8.78
	Low Density Residential	15.00	60.01	12301.03	11.52	7.68	3.36	4.80
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	2.00	8.18	3516.54	1.14	9.81	2.04	29.85
	Highway	10.00	40.66	40781.98	89.45	232.98	25.21	105.72
	Arterial	0.00	3.47	999.36	3.89	1.94	0.52	1.94
	Open Water	5.00	20.45	3782.33	2.66	0.82	0.82	0.82
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	408.90	126922.39	245.11	257.40	35.28	154.59
Calhoun Creek 4C080 Area 74	Wetland, Forest, Preservation	40.00	29.60	88.80	0.89	0.30	0.30	0.30
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.00	14.80	3034.00	2.84	1.89	0.83	1.18
	Medium Density Residential	10.00	7.40	3034.00	2.78	1.89	0.83	1.18
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	25.00	18.31	18364.93	40.28	104.92	11.35	47.61
	Arterial	0.00	0.19	54.72	0.21	0.11	0.03	0.11
	Open Water	5.00	3.70	684.50	0.48	0.15	0.15	0.15
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	74.00	25260.95	47.49	109.26	13.48	50.52

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4C085 Area 47	Wetland, Forest, Preservation	5.00	2.35	7.05	0.07	0.02	0.02	0.02
	Agriculture	20.00	9.27	4171.50	7.97	0.09	0.09	0.09
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	2.26	951.46	4.07	0.42	0.18	2.46
	Low Density Residential	65.00	29.89	6127.45	5.74	3.83	1.67	2.39
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	2.35	2357.05	5.17	13.47	1.46	6.11
	Arterial	0.00	0.88	253.44	0.99	0.49	0.13	0.49
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	47.00	13867.95	24.01	18.32	3.56	11.57
Calhoun Creek 4C090 Area 28.9	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	5.00	1.45	650.25	1.24	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	1.45	296.23	0.28	0.18	0.08	0.12
	Medium Density Residential	55.00	15.60	6393.95	5.86	3.99	1.75	2.50
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	1.45	1525.92	1.55	3.90	0.58	3.03
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	30.00	8.67	1603.95	1.13	0.35	0.35	0.35
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	28.90	10556.70	10.39	8.61	2.81	6.17
Calhoun Creek 4C091 Area 65	Wetland, Forest, Preservation	10.00	6.50	19.50	0.20	0.07	0.07	0.07
	Agriculture	23.00	14.83	6673.50	12.75	0.15	0.15	0.15
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	10.00	6.50	2736.50	11.70	1.20	0.52	7.09
	Low Density Residential	45.00	27.60	5658.00	5.30	3.53	1.55	2.21
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	6.32	6673.92	6.76	17.06	2.53	13.27
	Industrial	2.00	1.30	559.00	0.18	1.56	0.33	4.75
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.95	561.60	2.18	1.09	0.29	1.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	65.00	22882.02	39.08	24.66	5.42	28.62
Calhoun Creek 4D010 Area 133.8	Wetland, Forest, Preservation	25.00	33.45	100.35	1.00	0.33	0.33	0.33
	Agriculture	45.00	60.21	27094.50	51.78	0.60	0.60	0.60
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	25.00	33.19	6803.95	6.37	4.25	1.86	2.66
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	6.69	6710.07	14.72	38.33	4.15	17.39
	Arterial	0.00	0.26	74.88	0.29	0.15	0.04	0.15
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	133.80	40783.75	74.17	43.66	6.98	21.13
Calhoun Creek 4E010 Area 317.4	Wetland, Forest, Preservation	30.00	95.17	285.51	2.86	0.95	0.95	0.95
	Agriculture	20.00	61.80	27810.00	53.15	0.62	0.62	0.62
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	9.29	3911.93	16.73	1.71	0.74	10.13
	Low Density Residential	6.00	18.46	3785.12	3.55	2.36	1.03	1.48
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	6.27	6619.01	6.71	16.92	2.51	13.16
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	7.00	22.22	22284.65	48.88	127.31	13.78	57.77
	Arterial	0.00	2.62	754.56	2.93	1.47	0.39	1.47
	Open Water	2.00	6.35	1174.38	0.83	0.25	0.25	0.25
	Extractive, Landfill	30.00	95.22	318415.68	8.47	0.95	0.95	0.95
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	317.40	385040.84	144.09	152.55	21.23	86.78

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4E020 Area 21.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	83.00	17.49	17541.47	38.48	100.21	10.84	45.47
	Arterial	0.00	0.19	54.72	0.21	0.11	0.03	0.11
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	17.00	3.62	12108.62	0.32	0.04	0.04	0.04
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	21.30	29704.81	39.01	100.35	10.91	45.61
Calhoun Creek 4E030 Area 600.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calhoun Creek 4E040 Area 42.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calhoun Creek 4E050 Area 29.9	Wetland, Forest, Preservation	20.00	5.98	17.94	0.18	0.06	0.06	0.06
	Agriculture	59.00	17.03	7663.95	14.65	0.17	0.17	0.17
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.00	5.98	1225.90	1.15	0.77	0.33	0.48
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	1.00	0.30	299.90	0.66	1.71	0.19	0.78
	Arterial	0.00	0.61	175.68	0.68	0.34	0.09	0.34
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	29.90	9383.37	17.32	3.05	0.84	1.83
Calhoun Creek 4E060 Area 256.2	Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	38.00	96.07	43229.70	82.62	0.96	0.96	0.96
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	25.62	5252.10	4.92	3.28	1.43	2.05
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.54	443.52	1.72	0.86	0.23	0.86
	Open Water	2.00	5.12	947.94	0.67	0.20	0.20	0.20
	Extractive, Landfill	50.00	127.85	427530.40	11.38	1.28	1.28	1.28
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	256.20	477403.66	101.31	6.59	4.11	5.36

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4F010 Area 251.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	50.00	123.65	55642.50	106.34	1.24	1.24	1.24
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	2.00	4.98	1021.72	0.96	0.64	0.28	0.40
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	10.00	25.12	25195.36	55.26	143.94	15.57	65.31
	Arterial	0.00	1.99	573.12	2.23	1.11	0.30	1.11
	Open Water	11.00	27.63	5111.92	3.59	1.11	1.11	1.11
	Extractive, Landfill	27.00	67.82	226803.46	6.04	0.68	0.68	0.68
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	251.20	314348.08	174.42	148.71	19.17	69.85
Upper Root River 2A010 Area 101.1	Wetland, Forest, Preservation	25.00	25.28	75.83	0.76	0.25	0.25	0.25
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	50.00	50.21	20937.57	141.09	0.50	0.50	3.01
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	24.50	24.41	5003.95	4.69	3.12	1.37	1.95
	Medium Density Residential	0.50	0.46	186.76	0.17	0.12	0.05	0.07
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.75	216.00	0.84	0.42	0.11	0.42
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	101.10	26420.10	147.55	4.42	2.29	5.71
Upper Root River 2A015 Area 64.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	40.00	25.73	10729.41	72.30	0.26	0.26	1.54
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	60.00	38.65	15846.50	14.53	9.89	4.33	6.18
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.22	63.36	0.25	0.12	0.03	0.12
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	64.60	26639.27	87.08	10.27	4.62	7.85
Upper Root River 2A020 Area 105.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.50	0.53	219.55	1.48	0.01	0.01	0.03
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	32.00	33.61	6889.23	6.45	4.30	1.88	2.69
	Medium Density Residential	52.50	55.28	22665.83	20.79	14.15	6.19	8.85
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	5.27	5559.84	5.63	14.22	2.11	11.06
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.17	48.96	0.19	0.10	0.03	0.10
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	10.00	10.45	5643.00	4.60	4.39	0.00	20.90
	<i>Subtotal</i>	100.00	105.30	41026.41	39.14	37.16	10.21	43.62
Upper Root River 2A030 Area 148	Wetland, Forest, Preservation	50.00	74.00	222.00	2.22	0.74	0.74	0.74
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	25.00	37.00	7585.00	7.10	4.74	2.07	2.96
	Medium Density Residential	25.00	37.00	15170.00	13.91	9.47	4.14	5.92
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	148.00	22977.00	23.24	14.95	6.96	9.62

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2A040 Area 79.7	Wetland, Forest, Preservation	5.00	3.98	11.93	0.12	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	15.00	11.80	4965.70	21.23	2.17	0.94	12.86
	Low Density Residential	30.00	23.85	4889.25	4.58	3.05	1.34	1.91
	Medium Density Residential	45.00	35.37	14499.65	13.30	9.05	3.96	5.66
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	3.98	4197.60	4.25	10.73	1.59	8.35
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.74	213.12	0.83	0.41	0.11	0.41
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	79.70	28777.24	44.31	25.46	7.98	29.22
Upper Root River 2A050 Area 189.8	Wetland, Forest, Preservation	10.00	18.98	56.94	0.57	0.19	0.19	0.19
	Agriculture	5.00	9.49	4270.50	8.16	0.09	0.09	0.09
	Park	15.00	28.47	11871.99	80.00	0.28	0.28	1.71
	Institutional	10.00	18.96	7982.16	34.13	3.49	1.52	20.67
	Low Density Residential	27.55	52.29	10719.43	10.04	6.69	2.93	4.18
	Medium Density Residential	16.15	30.25	12403.61	11.38	7.74	3.39	4.84
	High Density Residential	2.30	4.35	2494.26	2.26	1.56	0.70	0.97
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	4.00	7.59	3264.56	1.06	9.11	1.90	27.71
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.44	126.72	0.49	0.25	0.07	0.25
	Open Water	3.00	5.69	1053.39	0.74	0.23	0.23	0.23
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	7.00	13.29	7174.44	5.85	5.58	0.00	26.57
	Subtotal	100.00	189.80	61418.00	154.68	35.22	11.29	87.41
Upper Root River 2A060 Area 295.2	Wetland, Forest, Preservation	6.00	17.66	52.99	0.53	0.18	0.18	0.18
	Agriculture	10.00	29.39	13225.50	25.28	0.29	0.29	0.29
	Park	14.00	41.33	17233.78	116.13	0.41	0.41	2.48
	Institutional	7.00	20.49	8627.97	36.89	3.77	1.64	22.34
	Low Density Residential	60.00	175.79	36036.95	33.75	22.50	9.84	14.06
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.68	483.84	1.88	0.94	0.25	0.94
	Open Water	3.00	8.86	1638.36	1.15	0.35	0.35	0.35
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	295.20	77299.39	215.61	28.45	12.97	40.65
Upper Root River 2B010 Area 106.2	Wetland, Forest, Preservation	9.00	9.56	28.67	0.29	0.10	0.10	0.10
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	25.00	26.55	11071.35	74.61	0.27	0.27	1.59
	Institutional	2.00	2.12	894.20	3.82	0.39	0.17	2.32
	Low Density Residential	52.00	54.15	11101.57	10.40	6.93	3.03	4.33
	Medium Density Residential	3.00	3.19	1306.26	1.20	0.82	0.36	0.51
	High Density Residential	5.00	5.21	2990.54	2.71	1.88	0.83	1.17
	Commercial	4.00	4.22	4454.21	4.51	11.39	1.69	8.86
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.20	345.60	1.34	0.67	0.18	0.67
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	106.20	32192.41	98.88	22.44	6.62	19.54
Upper Root River 2B012 Area 22.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	95.00	20.58	8435.75	7.74	5.27	2.30	3.29
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	1.09	1145.76	1.16	2.93	0.43	2.28
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.64	184.32	0.72	0.36	0.10	0.36
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	22.30	9765.83	9.61	8.56	2.83	5.93

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2B013 Area 25.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	100.00	25.60	10496.00	9.63	6.55	2.87	4.10
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	25.60	10496.00	9.63	6.55	2.87	4.10
Upper Root River 2B014 Area 67.4	Wetland, Forest, Preservation	8.00	5.19	15.58	0.16	0.05	0.05	0.05
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	80.00	53.72	22025.20	20.20	13.75	6.02	8.60
	High Density Residential	5.00	3.20	1836.80	1.66	1.15	0.51	0.72
	Commercial	5.00	3.27	3453.12	3.50	8.83	1.31	6.87
	Industrial	2.00	1.35	579.64	0.19	1.62	0.34	4.92
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.67	192.96	0.75	0.38	0.10	0.38
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	67.40	28103.30	26.46	25.78	8.33	21.53
Upper Root River 2B015 Area 42.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	8.00	3.42	1537.20	2.94	0.03	0.03	0.03
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	92.00	38.65	15848.14	14.53	9.90	4.33	6.18
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.63	181.44	0.71	0.35	0.09	0.35
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	42.70	17566.78	18.18	10.28	4.46	6.57
Upper Root River 2B020 Area 83.5	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	20.00	16.46	7407.00	14.16	0.16	0.16	0.16
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	3.94	1656.64	7.08	0.72	0.31	4.29
	Low Density Residential	30.00	24.24	4969.20	4.65	3.10	1.36	1.94
	Medium Density Residential	25.00	20.08	8230.75	7.55	5.14	2.25	3.21
	High Density Residential	10.00	8.35	4792.90	4.34	3.01	1.34	1.87
	Commercial	7.00	5.65	5961.12	6.04	15.24	2.26	11.85
	Industrial	3.00	2.36	1012.65	0.33	2.83	0.59	8.60
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.44	702.72	2.73	1.37	0.37	1.37
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	83.50	34732.98	46.89	31.57	8.63	33.29
Upper Root River 2B030 Area 75.9	Wetland, Forest, Preservation	20.00	15.18	45.54	0.46	0.15	0.15	0.15
	Agriculture	27.00	19.97	8987.85	17.18	0.20	0.20	0.20
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	50.00	37.60	15416.00	14.14	9.63	4.21	6.02
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.23	2351.71	2.38	6.01	0.89	4.68
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.92	264.96	1.03	0.52	0.14	0.52
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	75.90	27066.06	35.18	16.51	5.59	11.56

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2B040 Area 68.3	Wetland, Forest, Preservation	11.00	7.51	22.54	0.23	0.08	0.08	0.08
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	89.00	60.79	24922.67	22.86	15.56	6.81	9.73
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	68.30	24945.21	23.08	15.64	6.88	9.80
Upper Root River 2B050 Area 249.1	Wetland, Forest, Preservation	10.00	24.91	74.73	0.75	0.25	0.25	0.25
	Agriculture	30.00	73.60	33120.00	63.30	0.74	0.74	0.74
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	7.41	3120.87	13.34	1.36	0.59	8.08
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	32.00	79.13	32444.12	29.75	20.26	8.86	12.66
	High Density Residential	17.00	42.23	24238.30	21.96	15.20	6.76	9.46
	Commercial	5.00	12.05	12719.52	12.89	32.52	4.82	25.29
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.30	662.40	2.58	1.29	0.35	1.29
	Open Water	3.00	7.47	1382.51	0.97	0.30	0.30	0.30
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	249.10	107762.45	145.53	71.92	22.66	58.07
Upper Root River 2B060 Area 248.6	Wetland, Forest, Preservation	10.00	24.86	74.58	0.75	0.25	0.25	0.25
	Agriculture	45.00	110.94	49923.00	95.41	1.11	1.11	1.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	8.00	19.89	8372.85	35.80	3.66	1.59	21.68
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	22.00	53.33	21866.12	20.05	13.65	5.97	8.53
	High Density Residential	10.00	24.37	13988.38	12.67	8.77	3.90	5.46
	Commercial	5.00	12.25	12936.00	13.11	33.08	4.90	25.73
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.96	852.48	3.32	1.66	0.44	1.66
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	248.60	108013.41	181.10	62.18	18.17	64.41
Upper Root River 2C010 Area 200.7	Wetland, Forest, Preservation	5.00	10.04	30.11	0.30	0.10	0.10	0.10
	Agriculture	25.00	49.70	22362.75	42.74	0.50	0.50	0.50
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	10.00	20.07	8449.47	36.13	3.69	1.61	21.88
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	45.00	88.67	36352.65	33.34	22.70	9.93	14.19
	High Density Residential	12.00	23.62	13560.18	12.28	8.50	3.78	5.29
	Commercial	3.00	5.88	6210.34	6.29	15.88	2.35	12.35
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.73	786.24	3.06	1.53	0.41	1.53
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	200.70	87751.73	134.14	52.90	18.68	55.83
Upper Root River 2D010 Area 162.3	Wetland, Forest, Preservation	6.00	9.74	29.21	0.29	0.10	0.10	0.10
	Agriculture	15.00	23.57	10604.25	20.27	0.24	0.24	0.24
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	10.00	15.48	6517.08	27.86	2.85	1.24	16.87
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	69.00	111.22	45598.97	41.82	28.47	12.46	17.79
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.30	662.40	2.58	1.29	0.35	1.29
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	162.30	63411.91	92.82	32.94	14.37	36.29

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2D020 Area 265.2	Wetland, Forest, Preservation	16.00	42.39	127.18	1.27	0.42	0.42	0.42
	Agriculture	35.00	92.08	41436.00	79.19	0.92	0.92	0.92
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	5.30	2232.98	9.55	0.98	0.42	5.78
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	47.00	123.68	50710.44	46.51	31.66	13.85	19.79
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.74	501.12	1.95	0.97	0.26	0.97
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	265.20	95007.72	138.46	34.96	15.88	27.89
Upper Root River 2D030 Area 75.1	Wetland, Forest, Preservation	5.00	3.76	11.27	0.11	0.04	0.04	0.04
	Agriculture	15.00	11.24	5055.75	9.66	0.11	0.11	0.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	80.00	59.77	24505.70	22.47	15.30	6.69	9.56
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.34	97.92	0.38	0.19	0.05	0.19
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	75.10	29670.64	32.63	15.64	6.90	9.90
Upper Root River 2D031 Area 33.2	Wetland, Forest, Preservation	12.00	3.98	11.95	0.12	0.04	0.04	0.04
	Agriculture	63.00	20.92	9412.20	17.99	0.21	0.21	0.21
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	25.00	8.30	1701.50	1.59	1.06	0.46	0.66
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	33.20	11125.65	19.70	1.31	0.71	0.91
Upper Root River 2D032 Area 52.7	Wetland, Forest, Preservation	3.00	1.58	4.74	0.05	0.02	0.02	0.02
	Agriculture	8.00	4.22	1897.20	3.63	0.04	0.04	0.04
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	89.00	46.90	19230.23	17.64	12.01	5.25	7.50
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	52.70	21132.17	21.31	12.07	5.31	7.56
Upper Root River 2D040 Area 173.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	25.00	42.01	18904.50	36.13	0.42	0.42	0.42
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	35.00	59.74	12246.70	11.47	7.65	3.35	4.78
	Medium Density Residential	10.00	17.36	7117.60	6.53	4.44	1.94	2.78
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	8.54	9018.24	9.14	23.06	3.42	17.93
	Industrial	5.00	8.68	3732.40	1.22	10.42	2.17	31.68
	Highway	20.00	34.48	34583.44	75.86	197.57	21.38	89.65
	Arterial	0.00	2.79	803.52	3.12	1.56	0.42	1.56
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	173.60	86406.40	143.46	245.12	33.09	148.80

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2E010 Area 189.3	Wetland, Forest, Preservation	15.00	28.40	85.19	0.85	0.28	0.28	0.28
	Agriculture	53.00	99.93	44968.05	85.94	1.00	1.00	1.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	3.79	1593.91	6.81	0.70	0.30	4.13
	Low Density Residential	25.00	46.39	9508.93	8.91	5.94	2.60	3.71
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	9.47	9493.40	20.82	54.23	5.87	24.61
	Arterial	0.00	1.34	385.92	1.50	0.75	0.20	0.75
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	189.30	66035.38	124.84	62.90	10.25	34.48
Upper Root River 2E011 Area 98.2	Wetland, Forest, Preservation	26.00	25.02	75.07	0.75	0.25	0.25	0.25
	Agriculture	20.00	18.66	8397.00	16.05	0.19	0.19	0.19
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	10.00	9.49	3995.29	17.08	1.75	0.76	10.34
	Low Density Residential	18.00	17.60	3607.18	3.38	2.25	0.99	1.41
	Medium Density Residential	8.00	6.98	2860.16	2.62	1.79	0.78	1.12
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.81	2963.14	3.00	7.58	1.12	5.89
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	15.00	14.73	14774.19	32.41	84.40	9.13	38.30
	Arterial	0.00	2.92	840.96	3.27	1.64	0.44	1.64
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	98.20	37512.98	78.56	99.84	13.66	59.13
Upper Root River 2E020 Area 116.7	Wetland, Forest, Preservation	5.00	5.84	17.51	0.18	0.06	0.06	0.06
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	8.00	9.30	3913.62	16.73	1.71	0.74	10.13
	Low Density Residential	82.00	94.96	19467.62	18.23	12.16	5.32	7.60
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	5.84	5852.51	12.84	33.43	3.62	15.17
	Arterial	0.00	0.77	221.76	0.86	0.43	0.12	0.43
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	116.70	29473.01	48.84	47.79	9.85	33.39
Upper Root River 2E030 Area 39.9	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	100.00	39.90	8179.50	7.66	5.11	2.23	3.19
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	39.90	8179.50	7.66	5.11	2.23	3.19
Upper Root River 2E040 Area 11.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	5.00	0.57	256.50	0.49	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	95.00	10.83	2220.15	2.08	1.39	0.61	0.87
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	11.40	2476.65	2.57	1.39	0.61	0.87

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2E050 Area 42.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	2.00	0.85	384.30	0.73	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	98.00	41.85	8578.43	8.03	5.36	2.34	3.35
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	42.70	8962.73	8.77	5.36	2.35	3.36
Upper Root River 2E060 Area 169.4	Wetland, Forest, Preservation	10.00	16.94	50.82	0.51	0.17	0.17	0.17
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	88.00	147.94	30328.11	28.40	18.94	8.28	11.84
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.19	342.72	1.33	0.67	0.18	0.67
	Open Water	2.00	3.33	615.68	0.43	0.13	0.13	0.13
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	169.40	31337.33	30.68	19.91	8.77	12.80
Upper Root River 2E070 Area 64.1	Wetland, Forest, Preservation	35.00	22.44	67.31	0.67	0.22	0.22	0.22
	Agriculture	5.00	3.21	1442.25	2.76	0.03	0.03	0.03
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	30.00	18.92	3878.60	3.63	2.42	1.06	1.51
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.31	89.28	0.35	0.17	0.05	0.17
	Open Water	30.00	19.23	3557.55	2.50	0.77	0.77	0.77
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	64.10	9034.99	9.91	3.62	2.13	2.71
Upper Root River 2E071 Area 18.5	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	98.00	17.93	3675.65	3.44	2.30	1.00	1.43
	Medium Density Residential	2.00	0.20	82.00	0.08	0.05	0.02	0.03
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.37	106.56	0.41	0.21	0.06	0.21
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	18.50	3864.21	3.93	2.55	1.08	1.67
Upper Root River 2E080 Area 129	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	90.00	115.44	51948.00	99.28	1.15	1.15	1.15
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	6.30	1291.50	1.21	0.81	0.35	0.50
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	6.45	6811.20	6.90	17.42	2.58	13.55
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.81	233.28	0.91	0.45	0.12	0.45
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	129.00	60283.98	108.30	19.83	4.21	15.66

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2E090 Area 155.1	Wetland, Forest, Preservation	65.00	100.82	302.45	3.02	1.01	1.01	1.01
	Agriculture	15.00	22.62	10176.75	19.45	0.23	0.23	0.23
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	23.11	4736.53	4.44	2.96	1.29	1.85
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.81	233.28	0.91	0.45	0.12	0.45
	Open Water	5.00	7.76	1434.68	1.01	0.31	0.31	0.31
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	155.10	16883.68	28.82	4.96	2.96	3.85
Upper Root River 2F010 Area 135.2	Wetland, Forest, Preservation	15.00	20.28	60.84	0.61	0.20	0.20	0.20
	Agriculture	30.00	39.88	17946.00	34.30	0.40	0.40	0.40
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	45.00	60.39	12379.95	11.59	7.73	3.38	4.83
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	10.00	13.52	13560.56	29.74	77.47	8.38	35.15
	Arterial	0.00	1.13	325.44	1.27	0.63	0.17	0.63
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	135.20	44272.79	77.51	86.43	12.54	41.22
Tess Corners Creek 5A010 Area 234.8	Wetland, Forest, Preservation	40.00	93.84	281.52	2.82	0.94	0.94	0.94
	Agriculture	5.00	11.26	5067.00	9.68	0.11	0.11	0.11
	Park	15.00	35.22	14686.74	98.97	0.35	0.35	2.11
	Institutional	5.00	11.68	4917.28	21.02	2.15	0.93	12.73
	Low Density Residential	35.00	80.61	16525.05	15.48	10.32	4.51	6.45
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.19	630.72	2.45	1.23	0.33	1.23
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	234.80	42108.31	150.42	15.10	7.18	23.57
Tess Corners Creek 5A020 Area 1337.9	Wetland, Forest, Preservation	30.00	401.01	1203.03	12.03	4.01	4.01	4.01
	Agriculture	53.00	702.15	315966.15	603.85	7.02	7.02	7.02
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	26.76	11265.12	48.16	4.92	2.14	29.17
	Low Density Residential	10.00	130.42	26736.10	25.04	16.69	7.30	10.43
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	40.02	42257.95	42.82	108.05	16.01	84.04
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	10.79	3107.52	12.08	6.04	1.62	6.04
	Open Water	2.00	26.76	4950.23	3.48	1.07	1.07	1.07
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	1337.90	405486.10	747.46	147.81	39.17	141.78
Tess Corners Creek 5A030 Area 49.8	Wetland, Forest, Preservation	12.00	5.98	17.93	0.18	0.06	0.06	0.06
	Agriculture	60.00	29.04	13068.00	24.97	0.29	0.29	0.29
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	23.00	10.68	2190.22	2.05	1.37	0.60	0.85
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	2.43	2566.08	2.60	6.56	0.97	5.10
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.67	480.96	1.87	0.94	0.25	0.94
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	49.80	18323.19	31.68	9.21	2.17	7.24

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Tess Corners Creek 5A031 Area 84.5	Wetland, Forest, Preservation	10.00	8.45	25.35	0.25	0.08	0.08	0.08
	Agriculture	40.00	33.05	14872.50	28.42	0.33	0.33	0.33
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	8.34	1709.70	1.60	1.07	0.47	0.67
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	40.00	33.59	35471.04	35.94	90.69	13.44	70.54
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.07	308.16	1.20	0.60	0.16	0.60
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	84.50	52386.75	67.42	92.77	14.48	72.22
Underwood Creek 1A010 Area 160.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	89.00	140.86	57750.96	52.96	36.06	15.78	22.54
	High Density Residential	2.00	2.91	1669.19	1.51	1.05	0.47	0.65
	Commercial	2.00	3.04	3208.13	3.25	8.20	1.22	6.38
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.46	708.48	2.76	1.38	0.37	1.38
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	7.00	11.14	6014.52	4.90	4.68	0.00	22.28
	Subtotal	100.00	160.40	69351.28	65.38	51.36	17.83	53.22
Underwood Creek 1A020 Area 26.13	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	89.00	22.91	4695.67	4.40	2.93	1.28	1.83
	Medium Density Residential	10.00	2.25	923.73	0.85	0.58	0.25	0.36
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	0.22	233.69	0.24	0.60	0.09	0.46
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.75	216.00	0.84	0.42	0.11	0.42
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	26.13	6069.09	6.32	4.53	1.74	3.08
Underwood Creek 1A030 Area 128.1	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTSIDE STUDY AREA	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Underwood Creek 1A031 Area 179.6	Wetland, Forest, Preservation	2.00	3.59	10.78	0.11	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	34.00	61.02	25691.10	109.84	11.23	4.88	66.52
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	57.00	101.45	41595.32	38.15	25.97	11.36	16.23
	High Density Residential	2.00	3.55	2038.85	1.85	1.28	0.57	0.80
	Commercial	3.00	5.10	5383.49	5.45	13.76	2.04	10.71
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.29	371.52	1.44	0.72	0.19	0.72
	Open Water	2.00	3.59	664.52	0.47	0.14	0.14	0.14
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	179.60	75755.58	157.31	53.15	19.23	95.15

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Underwood Creek 1A032	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	1.00	0.96	431.28	0.82	0.01	0.01	0.01
Area 95.84	Park	10.00	9.53	3975.68	26.79	0.10	0.10	0.57
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	40.00	38.34	7858.88	7.36	4.91	2.15	3.07
	Medium Density Residential	46.00	43.32	17759.72	16.29	11.09	4.85	6.93
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.86	3015.09	3.06	7.71	1.14	6.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.84	241.92	0.94	0.47	0.13	0.47
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	95.84	33282.57	55.26	24.28	8.37	17.05
Deer Creek 3A010	Wetland, Forest, Preservation	25.00	85.75	257.24	2.57	0.86	0.86	0.86
	Agriculture	10.00	33.57	15106.50	28.87	0.34	0.34	0.34
Area 343.5	Park	8.80	30.23	12605.08	84.94	0.30	0.30	1.81
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	3.00	9.83	2014.13	1.89	1.26	0.55	0.79
	Medium Density Residential	22.60	76.82	31496.61	28.88	19.67	8.60	12.29
	High Density Residential	21.00	71.62	41107.01	37.24	25.78	11.46	16.04
	Commercial	1.60	5.29	5582.02	5.66	14.27	2.11	11.10
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.93	843.84	3.28	1.64	0.44	1.64
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	8.00	27.48	14839.20	12.09	11.54	0.00	54.96
	Subtotal	100.00	343.50	123851.61	205.42	75.66	24.66	99.83
Deer Creek 3A011	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	15.00	2.13	958.50	1.83	0.02	0.02	0.02
Area 14.2	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	80.00	10.96	4614.16	19.73	2.02	0.88	11.95
	Low Density Residential	4.00	0.53	108.24	0.10	0.07	0.03	0.04
	Medium Density Residential	1.00	0.14	58.22	0.05	0.04	0.02	0.02
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.44	126.72	0.49	0.25	0.07	0.25
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	14.20	5865.84	22.21	2.39	1.01	12.28
Deer Creek 3A020	Wetland, Forest, Preservation	12.00	25.30	75.89	0.76	0.25	0.25	0.25
	Agriculture	15.80	32.38	14569.38	27.84	0.32	0.32	0.32
Area 210.8	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.80	43.25	8865.51	8.30	5.54	2.42	3.46
	Medium Density Residential	2.00	4.22	1728.56	1.59	1.08	0.47	0.67
	High Density Residential	1.00	2.11	1209.99	1.10	0.76	0.34	0.47
	Commercial	6.00	12.50	13197.89	13.37	33.74	5.00	26.25
	Industrial	38.40	80.95	34807.30	11.33	97.14	20.24	295.46
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.80	518.40	2.02	1.01	0.27	1.01
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	4.00	8.31	4488.48	3.66	3.49	0.00	16.62
	Subtotal	100.00	210.80	79461.40	69.97	143.33	29.31	344.52
Deer Creek 3A030	Wetland, Forest, Preservation	7.00	11.35	34.04	0.34	0.11	0.11	0.11
	Agriculture	5.00	8.11	3647.25	6.97	0.08	0.08	0.08
Area 162.1	Park	7.00	11.28	4702.51	31.69	0.11	0.11	0.68
	Institutional	6.00	9.60	4039.92	17.27	1.77	0.77	10.46
	Low Density Residential	20.00	32.42	6646.10	6.22	4.15	1.82	2.59
	Medium Density Residential	33.00	52.76	21632.83	19.84	13.51	5.91	8.44
	High Density Residential	15.00	23.92	13727.21	12.44	8.61	3.83	5.36
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.33	383.04	1.49	0.74	0.20	0.74
	Open Water	7.00	11.35	2099.20	1.48	0.45	0.45	0.45
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	162.10	56912.09	97.74	29.54	13.28	28.92

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Deer Creek 3A031 Area 60	Wetland, Forest, Preservation	4.00	2.40	7.20	0.07	0.02	0.02	0.02
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	9.00	5.07	1039.35	0.97	0.65	0.28	0.41
	Medium Density Residential	1.00	0.60	246.00	0.23	0.15	0.07	0.10
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	0.60	633.60	0.64	1.62	0.24	1.26
	Industrial	85.00	50.28	21620.40	7.04	60.34	12.57	183.52
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.05	302.40	1.18	0.59	0.16	0.59
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	60.00	23848.95	10.13	63.37	13.34	185.90
Deer Creek 3A032 Area 169.4	Wetland, Forest, Preservation	15.00	25.33	75.99	0.76	0.25	0.25	0.25
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	1.00	1.69	713.17	3.05	0.31	0.14	1.85
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4.00	6.73	7102.66	7.20	18.16	2.69	14.12
	Industrial	80.00	134.05	57641.50	18.77	160.86	33.51	489.28
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.60	460.80	1.79	0.90	0.24	0.90
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	169.40	65994.12	31.56	180.48	36.83	506.40
Deer Creek 3A033 Area 212.9	Wetland, Forest, Preservation	20.00	42.32	126.96	1.27	0.42	0.42	0.42
	Agriculture	12.00	25.21	11343.60	21.68	0.25	0.25	0.25
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	10.57	4447.87	19.02	1.94	0.85	11.52
	Low Density Residential	10.00	21.21	4348.05	4.07	2.71	1.19	1.70
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	8.00	16.88	17827.39	18.06	45.58	6.75	35.45
	Industrial	45.00	93.04	40005.05	13.02	111.64	23.26	339.58
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.68	1059.84	4.12	2.06	0.55	2.06
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	212.90	79158.76	81.25	164.62	33.27	390.98
Deer Creek 3A040 Area 271.4	Wetland, Forest, Preservation	43.00	116.59	349.78	3.50	1.17	1.17	1.17
	Agriculture	6.00	15.86	7138.80	13.64	0.16	0.16	0.16
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	27.14	5563.70	5.21	3.47	1.52	2.17
	Medium Density Residential	25.00	65.91	27023.10	24.78	16.87	7.38	10.55
	High Density Residential	10.00	27.14	15578.36	14.11	9.77	4.34	6.08
	Commercial	6.00	15.76	16646.78	16.87	42.56	6.31	33.10
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.99	861.12	3.35	1.67	0.45	1.67
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	271.40	73161.64	81.46	75.68	21.32	54.90
Deer Creek 3A041 Area 10	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	10.00	1.00	450.00	0.86	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	90.00	8.75	9240.00	9.36	23.63	3.50	18.38
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.25	72.00	0.28	0.14	0.04	0.14
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	10.00	9762.00	10.50	23.78	3.55	18.53

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Deer Creek 3A042 Area 121	Wetland, Forest, Preservation	25.00	30.13	90.39	0.90	0.30	0.30	0.30
	Agriculture	0.00	-0.18	-81.00	-0.15	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	45.00	53.63	10994.15	10.30	6.86	3.00	4.29
	Medium Density Residential	5.00	6.05	2480.50	2.27	1.55	0.68	0.97
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	8.00	9.68	10222.08	10.36	26.14	3.87	20.33
	Industrial	17.00	20.51	8819.30	2.87	24.61	5.13	74.86
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.18	339.84	1.32	0.66	0.18	0.66
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	121.00	32865.26	27.87	60.12	13.16	101.41
Deer Creek 3A043 Area 123.4	Wetland, Forest, Preservation	15.00	18.07	54.21	0.54	0.18	0.18	0.18
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	35.00	42.66	45048.96	45.65	115.18	17.06	89.59
	Industrial	50.00	61.51	26449.30	8.61	73.81	15.38	224.51
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.16	334.08	1.30	0.65	0.17	0.65
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	123.40	71886.55	56.10	189.82	32.80	314.93
Deer Creek 3A044 Area 127.2	Wetland, Forest, Preservation	10.00	12.72	38.16	0.38	0.13	0.13	0.13
	Agriculture	15.00	18.84	8478.00	16.20	0.19	0.19	0.19
	Park	2.00	2.54	1060.85	7.15	0.03	0.03	0.15
	Institutional	2.00	2.54	1071.02	4.58	0.47	0.20	2.77
	Low Density Residential	15.00	18.71	3835.55	3.59	2.39	1.05	1.50
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	20.00	24.46	25829.76	26.17	66.04	9.78	51.37
	Industrial	36.00	45.05	19372.36	6.31	54.06	11.26	164.44
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.33	671.04	2.61	1.30	0.35	1.30
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	127.20	60356.74	66.99	124.61	22.99	221.85
Deer Creek 3A050 Area 122.4	Wetland, Forest, Preservation	20.00	24.48	73.44	0.73	0.24	0.24	0.24
	Agriculture	37.00	44.84	20177.10	38.56	0.45	0.45	0.45
	Park	10.00	12.24	5104.08	34.39	0.12	0.12	0.73
	Institutional	3.00	3.59	1512.23	6.47	0.66	0.29	3.92
	Low Density Residential	9.00	11.02	2258.28	2.12	1.41	0.62	0.88
	Medium Density Residential	2.00	2.07	847.88	0.78	0.53	0.23	0.33
	High Density Residential	7.00	8.49	4872.11	4.41	3.06	1.36	1.90
	Commercial	10.00	11.71	12365.76	12.53	31.62	4.68	24.59
	Industrial	2.00	2.45	1052.64	0.34	2.94	0.61	8.94
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.52	437.76	1.70	0.85	0.23	0.85
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	122.40	48701.28	102.04	41.88	8.83	42.83
Deer Creek 3A060 Area 216.8	Wetland, Forest, Preservation	25.00	54.20	162.60	1.63	0.54	0.54	0.54
	Agriculture	25.00	53.80	24210.00	46.27	0.54	0.54	0.54
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	12.00	26.02	5333.28	5.00	3.33	1.46	2.08
	Medium Density Residential	8.00	16.95	6951.14	6.37	4.34	1.90	2.71
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	10.71	11309.76	11.46	28.92	4.28	22.49
	Industrial	8.00	17.34	7457.92	2.43	20.81	4.34	63.31
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.92	264.96	1.03	0.52	0.14	0.52
	Open Water	2.00	4.34	802.16	0.56	0.17	0.17	0.17
	Extractive, Landfill	15.00	32.52	108746.88	2.89	0.33	0.33	0.33
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	216.80	165238.70	77.64	59.49	13.69	92.68

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Deer Creek 3A070 Area 429.8	Wetland, Forest, Preservation	10.00	42.98	128.94	1.29	0.43	0.43	0.43
	Agriculture	12.00	51.33	23096.70	44.14	0.51	0.51	0.51
	Park	6.00	25.79	10753.60	72.46	0.26	0.26	1.55
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	21.49	4405.45	4.13	2.75	1.20	1.72
	Medium Density Residential	60.00	255.59	104791.90	96.10	65.43	28.63	40.89
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	11.76	12422.78	12.59	31.76	4.71	24.70
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.67	1056.96	4.11	2.06	0.55	2.06
	Open Water	4.00	17.19	3180.52	2.23	0.69	0.69	0.69
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	429.80	159836.85	237.05	103.89	36.97	72.55
Deer Creek 3A080 Area 173.6	Wetland, Forest, Preservation	20.00	34.72	104.16	1.04	0.35	0.35	0.35
	Agriculture	5.00	8.37	3766.50	7.20	0.08	0.08	0.08
	Park	3.00	5.21	2171.74	14.63	0.05	0.05	0.31
	Institutional	30.00	52.08	21925.68	93.74	9.58	4.17	56.77
	Low Density Residential	27.00	46.73	9580.06	8.97	5.98	2.62	3.74
	Medium Density Residential	10.00	17.16	7035.60	6.45	4.39	1.92	2.75
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	5.21	5499.65	5.57	14.06	2.08	10.94
	Industrial	2.00	3.44	1480.06	0.48	4.13	0.86	12.56
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.68	195.84	0.76	0.38	0.10	0.38
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	173.60	51759.28	138.86	39.01	12.23	87.88
Poplar Creek 6A010 Area 610.6	Wetland, Forest, Preservation	32.00	193.76	581.29	5.81	1.94	1.94	1.94
	Agriculture	34.00	204.19	91887.30	175.61	2.04	2.04	2.04
	Park	5.00	30.53	12731.01	85.79	0.31	0.31	1.83
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	18.00	108.85	22313.84	20.90	13.93	6.10	8.71
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	10.00	61.06	26255.80	8.55	73.27	15.27	222.87
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	6.10	1756.80	6.83	3.42	0.92	3.42
	Open Water	1.00	6.11	1129.61	0.79	0.24	0.24	0.24
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	610.60	156655.65	304.28	95.15	26.80	241.05
Poplar Creek 6A011 Area 405.2	Wetland, Forest, Preservation	13.00	52.62	157.85	1.58	0.53	0.53	0.53
	Agriculture	60.00	240.22	108099.00	206.59	2.40	2.40	2.40
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	12.05	5071.37	21.68	2.22	0.96	13.13
	Low Density Residential	15.00	59.94	12287.70	11.51	7.67	3.36	4.80
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	1.00	4.05	1742.36	0.57	4.86	1.01	14.79
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.95	1137.60	4.42	2.21	0.59	2.21
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	8.00	32.38	108265.34	2.88	0.32	0.32	0.32
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	405.20	236761.22	249.23	20.22	9.18	38.18
Poplar Creek 6A020 Area 313.1	Wetland, Forest, Preservation	36.00	112.57	337.70	3.38	1.13	1.13	1.13
	Agriculture	28.00	86.02	38708.10	73.98	0.86	0.86	0.86
	Park	3.00	9.39	3916.88	26.39	0.09	0.09	0.56
	Institutional	5.00	15.66	6590.76	28.18	2.88	1.25	17.06
	Low Density Residential	7.00	21.70	4447.89	4.17	2.78	1.22	1.74
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	10.00	31.22	17920.28	16.23	11.24	5.00	6.99
	Commercial	5.00	15.49	16352.16	16.57	41.81	6.19	32.52
	Industrial	5.00	15.56	6688.65	2.18	18.67	3.89	56.78
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.38	685.44	2.67	1.33	0.36	1.33
	Open Water	1.00	3.13	579.24	0.41	0.13	0.13	0.13
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	313.10	96227.08	174.15	80.91	20.11	119.09

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6A021 Area 136.6	Wetland, Forest, Preservation	52.00	70.96	212.89	2.13	0.71	0.71	0.71
	Agriculture	40.00	53.48	24066.00	45.99	0.53	0.53	0.53
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	4.00	5.46	1120.12	1.05	0.70	0.31	0.44
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	2.69	2842.75	2.88	7.27	1.08	5.65
	Industrial	2.00	2.63	1131.76	0.37	3.16	0.66	9.61
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.37	394.56	1.53	0.77	0.21	0.77
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	136.60	29768.08	53.95	13.14	3.49	17.71
Poplar Creek 6A022 Area 71.2	Wetland, Forest, Preservation	5.00	3.56	10.68	0.11	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	28.00	19.89	8372.01	35.79	3.66	1.59	21.68
	Low Density Residential	65.00	46.08	9446.40	8.85	5.90	2.58	3.69
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.25	72.00	0.28	0.14	0.04	0.14
	Open Water	2.00	1.42	263.44	0.19	0.06	0.06	0.06
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	71.20	18164.53	45.21	9.79	4.30	25.59
Poplar Creek 6A023 Area 333.1	Wetland, Forest, Preservation	20.00	66.62	199.86	2.00	0.67	0.67	0.67
	Agriculture	45.00	149.27	67169.25	128.37	1.49	1.49	1.49
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	16.66	7011.76	29.98	3.06	1.33	18.15
	Low Density Residential	30.00	98.61	20215.05	18.93	12.62	5.52	7.89
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.95	561.60	2.18	1.09	0.29	1.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	333.10	95157.52	181.46	18.94	9.31	29.29
Poplar Creek 6A030 Area 108.2	Wetland, Forest, Preservation	25.00	27.05	81.15	0.81	0.27	0.27	0.27
	Agriculture	50.00	52.91	23809.50	45.50	0.53	0.53	0.53
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	15.00	16.06	6761.26	28.91	2.96	1.28	17.51
	Low Density Residential	8.00	8.59	1760.13	1.65	1.10	0.48	0.69
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	2.00	2.14	921.92	0.30	2.57	0.54	7.83
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.45	417.60	1.62	0.81	0.22	0.81
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	108.20	33751.56	78.79	8.24	3.32	27.63
Poplar Creek 6A040 Area 159.9	Wetland, Forest, Preservation	30.00	47.97	143.91	1.44	0.48	0.48	0.48
	Agriculture	45.00	71.69	32258.25	61.65	0.72	0.72	0.72
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	8.00	3365.90	14.39	1.47	0.64	8.71
	Low Density Residential	20.00	31.95	6549.75	6.13	4.09	1.79	2.56
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	159.90	42404.21	83.95	6.93	3.67	12.64

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6A041 Area 372.9	Wetland, Forest, Preservation	15.00	55.43	166.28	1.66	0.55	0.55	0.55
	Agriculture	28.00	103.09	46391.40	88.66	1.03	1.03	1.03
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	7.00	25.86	10888.32	46.55	4.76	2.07	28.19
	Low Density Residential	10.00	35.05	7185.25	6.73	4.49	1.96	2.80
	Medium Density Residential	27.00	100.68	41280.03	37.86	25.77	11.28	16.11
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	17.91	18907.68	19.16	48.34	7.16	37.60
	Industrial	7.00	26.10	11224.29	3.65	31.32	6.53	95.28
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	5.05	1454.40	5.66	2.83	0.76	2.83
	Open Water	1.00	3.73	689.87	0.48	0.15	0.15	0.15
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	372.90	138187.51	210.42	119.25	31.49	184.54
Poplar Creek 6A042 Area 78.3	Wetland, Forest, Preservation	33.00	25.84	77.52	0.78	0.26	0.26	0.26
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	47.00	36.80	7544.21	7.07	4.71	2.06	2.94
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	3.92	4134.24	4.19	10.57	1.57	8.22
	Industrial	15.00	11.75	5050.35	1.64	14.09	2.94	42.87
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	78.30	16806.31	13.67	29.63	6.82	54.29
Poplar Creek 6A043 Area 44.1	Wetland, Forest, Preservation	20.00	8.82	26.46	0.26	0.09	0.09	0.09
	Agriculture	0.00	-0.02	-9.00	-0.02	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	2.19	447.93	0.42	0.28	0.12	0.17
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	15.00	6.36	6710.88	6.80	17.16	2.54	13.35
	Industrial	60.00	26.46	11377.80	3.70	31.75	6.62	96.58
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	44.10	18640.47	11.51	49.45	9.41	110.36
Poplar Creek 6A044 Area 79.7	Wetland, Forest, Preservation	20.00	15.94	47.82	0.48	0.16	0.16	0.16
	Agriculture	0.00	-0.15	-67.50	-0.13	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	7.66	1570.30	1.47	0.98	0.43	0.61
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	7.92	8363.52	8.47	21.38	3.17	16.63
	Industrial	60.00	47.72	20519.60	6.68	57.26	11.93	174.18
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.61	175.68	0.68	0.34	0.09	0.34
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	79.70	30609.42	17.66	80.13	15.78	191.92
Poplar Creek 6A050 Area 92.5	Wetland, Forest, Preservation	5.00	4.63	13.88	0.14	0.05	0.05	0.05
	Agriculture	80.00	72.38	32571.00	62.25	0.72	0.72	0.72
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	13.75	2817.73	2.64	1.76	0.77	1.10
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.75	504.00	1.96	0.98	0.26	0.98
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	92.50	35906.60	66.98	3.51	1.80	2.85

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6A060 Area 567.9	Wetland, Forest, Preservation	24.00	135.17	405.50	4.05	1.35	1.35	1.35
	Agriculture	48.00	270.78	121851.90	232.87	2.71	2.71	2.71
	Park	7.00	39.68	16547.81	111.51	0.40	0.40	2.38
	Institutional	5.00	27.78	11693.28	50.00	5.11	2.22	30.27
	Low Density Residential	15.00	84.42	17305.08	16.21	10.81	4.73	6.75
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	5.66	5975.90	6.06	15.28	2.26	11.88
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.42	1272.96	4.95	2.48	0.66	2.48
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	567.90	175052.42	425.64	38.13	14.33	57.83
Poplar Creek 6A070 Area 116.8	Wetland, Forest, Preservation	6.00	7.01	21.02	0.21	0.07	0.07	0.07
	Agriculture	80.00	93.44	42048.00	80.36	0.93	0.93	0.93
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	11.00	12.78	2619.49	2.45	1.64	0.72	1.02
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	3.00	3.50	1506.72	0.49	4.20	0.88	12.79
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.07	20.16	0.08	0.04	0.01	0.04
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	116.80	46215.39	83.59	6.88	2.61	14.86
Poplar Creek 6A071 Area 680.8	Wetland, Forest, Preservation	22.00	149.77	449.30	4.49	1.50	1.50	1.50
	Agriculture	55.00	373.30	167985.00	321.04	3.73	3.73	3.73
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	102.07	20924.35	19.60	13.06	5.72	8.17
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.20	345.60	1.34	0.67	0.18	0.67
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	8.00	54.46	182127.62	4.85	0.54	0.54	0.54
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	680.80	371831.86	351.32	19.51	11.67	14.61
Poplar Creek 6A072 Area 786.6	Wetland, Forest, Preservation	35.00	274.57	823.71	8.24	2.75	2.75	2.75
	Agriculture	40.00	310.79	139855.50	267.28	3.11	3.11	3.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	22.97	9669.53	41.34	4.23	1.84	25.04
	Low Density Residential	20.00	155.66	31910.30	29.89	19.92	8.72	12.45
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	15.39	16253.95	16.47	41.56	6.16	32.32
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	7.22	2079.36	8.09	4.04	1.08	4.04
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	786.60	200592.35	371.30	75.61	23.65	79.71
Poplar Creek 6B010 Area 279.9	Wetland, Forest, Preservation	70.00	195.75	587.25	5.87	1.96	1.96	1.96
	Agriculture	10.00	26.68	12006.00	22.94	0.27	0.27	0.27
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	5.54	2331.50	9.97	1.02	0.44	6.04
	Low Density Residential	10.00	27.60	5658.00	5.30	3.53	1.55	2.21
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	2.80	2955.74	2.99	7.56	1.12	5.88
	Industrial	2.00	5.45	2342.64	0.76	6.54	1.36	19.89
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.09	601.92	2.34	1.17	0.31	1.17
	Open Water	5.00	14.00	2589.08	1.82	0.56	0.56	0.56
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	279.90	29072.13	52.00	22.60	7.57	37.96

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6B020 Area 349.7	Wetland, Forest, Preservation	36.00	125.89	377.68	3.78	1.26	1.26	1.26
	Agriculture	5.00	17.43	7841.25	14.99	0.17	0.17	0.17
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	52.00	180.90	37085.32	34.73	23.16	10.13	14.47
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	17.49	18464.16	18.71	47.21	6.99	36.72
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.00	288.00	1.12	0.56	0.15	0.56
	Open Water	2.00	6.99	1293.89	0.91	0.28	0.28	0.28
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	349.70	65350.30	74.23	72.64	18.99	53.46
Poplar Creek 6B030 Area 325.9	Wetland, Forest, Preservation	13.00	42.37	127.10	1.27	0.42	0.42	0.42
	Agriculture	30.00	96.74	43533.00	83.20	0.97	0.97	0.97
	Park	10.00	32.42	13519.14	91.10	0.32	0.32	1.95
	Institutional	1.00	3.26	1372.04	5.87	0.60	0.26	3.55
	Low Density Residential	30.00	96.21	19723.05	18.47	12.31	5.39	7.70
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	6.45	6809.09	6.90	17.41	2.58	13.54
	Industrial	1.00	3.26	1401.37	0.46	3.91	0.81	11.90
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.20	921.60	3.58	1.79	0.48	1.79
	Open Water	3.00	9.78	1808.75	1.27	0.39	0.39	0.39
	Extractive, Landfill	10.00	32.22	107743.68	2.87	0.32	0.32	0.32
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	325.90	196958.81	214.98	38.46	11.95	42.53
Poplar Creek 6B040 Area 210.2	Wetland, Forest, Preservation	45.00	94.58	283.74	2.84	0.95	0.95	0.95
	Agriculture	43.00	89.78	40399.20	77.21	0.90	0.90	0.90
	Park	5.00	10.51	4382.67	29.53	0.11	0.11	0.63
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	7.00	14.64	3002.02	2.81	1.87	0.82	1.17
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.69	198.72	0.77	0.39	0.10	0.39
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	210.20	48266.35	113.16	4.21	2.87	4.03
Poplar Creek 6B050 Area 119.6	Wetland, Forest, Preservation	70.00	83.18	249.54	2.50	0.83	0.83	0.83
	Agriculture	20.00	23.07	10381.50	19.84	0.23	0.23	0.23
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	11.72	2402.60	2.25	1.50	0.66	0.94
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.63	469.44	1.83	0.91	0.24	0.91
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	119.60	13503.08	26.41	3.48	1.96	2.91
Poplar Creek 6C010 Area 753.5	Wetland, Forest, Preservation	32.00	240.32	720.96	7.21	2.40	2.40	2.40
	Agriculture	28.00	209.13	94108.50	179.85	2.09	2.09	2.09
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.00	149.53	30653.65	28.71	19.14	8.37	11.96
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	15.00	15840.00	16.05	40.50	6.00	31.50
	Industrial	8.00	59.43	25554.90	8.32	71.32	14.86	216.92
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.74	1365.12	5.31	2.65	0.71	2.65
	Open Water	5.00	37.68	6969.88	4.90	1.51	1.51	1.51
	Extractive, Landfill	5.00	37.68	125985.20	3.35	0.38	0.38	0.38
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	753.50	301198.21	253.70	139.99	36.32	269.41

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Poplar Creek 6C020 Area 317.4	Wetland, Forest, Preservation	18.85	59.83	179.49	1.79	0.60	0.60	0.60
	Agriculture	40.05	126.35	56856.92	108.66	1.26	1.26	1.26
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	16.10	51.04	10463.49	9.80	6.53	2.86	4.08
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	3.00	9.52	5465.63	4.95	3.43	1.52	2.13
	Commercial	3.00	9.43	9960.19	10.09	25.47	3.77	19.81
	Industrial	4.00	12.70	5459.28	1.78	15.24	3.17	46.34
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.92	264.96	1.03	0.52	0.14	0.52
	Open Water	2.00	6.35	1174.38	0.83	0.25	0.25	0.25
	Extractive, Landfill	10.00	31.74	106138.56	2.82	0.32	0.32	0.32
	Railroad	3.00	9.52	5141.88	4.19	4.00	0.00	19.04
	Subtotal	100.00	317.40	201104.77	145.95	57.61	13.90	94.36
Poplar Creek 6C021 Area 145.7	Wetland, Forest, Preservation	15.00	21.86	65.57	0.66	0.22	0.22	0.22
	Agriculture	37.00	53.91	24259.05	46.36	0.54	0.54	0.54
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	2.91	1226.79	5.25	0.54	0.23	3.18
	Low Density Residential	45.00	65.57	13440.83	12.59	8.39	3.67	5.25
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	0.76	799.39	0.81	2.04	0.30	1.59
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.70	201.60	0.78	0.39	0.11	0.39
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	145.70	39993.23	66.45	12.12	5.07	11.16
Poplar Creek 6C022 Area 292.3	Wetland, Forest, Preservation	21.00	60.43	181.30	1.81	0.60	0.60	0.60
	Agriculture	28.00	81.08	36487.80	69.73	0.81	0.81	0.81
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	7.00	20.46	8614.08	36.83	3.76	1.64	22.30
	Low Density Residential	5.00	12.72	2606.58	2.44	1.63	0.71	1.02
	Medium Density Residential	30.00	87.69	35952.90	32.97	22.45	9.82	14.03
	High Density Residential	3.00	8.77	5033.41	4.56	3.16	1.40	1.96
	Commercial	5.00	14.43	15232.80	15.43	38.95	5.77	30.29
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.80	1094.40	4.26	2.13	0.57	2.13
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	1.00	2.92	1578.42	1.29	1.23	0.00	5.85
	Subtotal	100.00	292.30	106781.68	169.32	74.72	21.33	79.00
Poplar Creek 6D010 Area 159.4	Wetland, Forest, Preservation	50.00	79.41	238.23	2.38	0.79	0.79	0.79
	Agriculture	5.00	7.76	3492.00	6.67	0.08	0.08	0.08
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	35.00	55.65	11408.25	10.68	7.12	3.12	4.45
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	3.19	3366.53	3.41	8.61	1.28	6.69
	Industrial	8.00	12.68	5453.26	1.78	15.22	3.17	46.29
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.71	204.48	0.80	0.40	0.11	0.40
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	159.40	24162.75	25.72	32.22	8.54	58.71
Poplar Creek 6D020 Area 91.1	Wetland, Forest, Preservation	55.00	49.18	147.53	1.48	0.49	0.49	0.49
	Agriculture	0.00	-0.17	-76.50	-0.15	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	1.82	767.06	3.28	0.34	0.15	1.99
	Low Density Residential	40.00	36.00	7380.00	6.91	4.61	2.02	2.88
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.52	2664.29	2.70	6.81	1.01	5.30
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.75	504.00	1.96	0.98	0.26	0.98
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	91.10	11386.38	16.18	13.23	3.92	11.63

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6E010 Area 34.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	2.00	0.68	307.80	0.59	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	1.00	0.34	147.06	0.05	0.41	0.09	1.25
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	95.00	32.49	6010.65	4.22	1.30	1.30	1.30
	Extractive, Landfill	2.00	0.68	2287.30	0.06	0.01	0.01	0.01
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	34.20	8752.81	4.92	1.72	1.40	2.56
Poplar Creek 6F010 Area 38.4	Wetland, Forest, Preservation	5.00	1.92	5.76	0.06	0.02	0.02	0.02
	Agriculture	73.00	28.03	12614.40	24.11	0.28	0.28	0.28
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	2.00	0.77	157.44	0.15	0.10	0.04	0.06
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	20.00	7.68	1420.80	1.00	0.31	0.31	0.31
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	38.40	14198.40	25.31	0.71	0.65	0.67
Mill Creek 7A010 Area 11.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	70.00	7.98	3327.66	22.42	0.08	0.08	0.48
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	30.00	3.25	666.25	0.62	0.42	0.18	0.26
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.17	48.96	0.19	0.10	0.03	0.10
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	11.40	4042.87	23.24	0.59	0.29	0.83
Mill Creek 7B010 Area 247.7	Wetland, Forest, Preservation	40.00	99.08	297.24	2.97	0.99	0.99	0.99
	Agriculture	45.00	111.47	50159.25	95.86	1.11	1.11	1.11
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	37.16	7616.78	7.13	4.76	2.08	2.97
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	247.70	58073.27	105.97	6.86	4.19	5.08
Mill Creek 7B020 Area 153.7	Wetland, Forest, Preservation	15.00	23.06	69.17	0.69	0.23	0.23	0.23
	Agriculture	48.00	73.05	32870.70	62.82	0.73	0.73	0.73
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	30.00	46.10	9450.50	8.85	5.90	2.58	3.69
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.74	213.12	0.83	0.41	0.11	0.41
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	7.00	10.76	35978.10	0.96	0.11	0.11	0.11
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	153.70	78581.58	74.15	7.38	3.76	5.17

Table —
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Existing Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Mill Creek 7B030 Area 1117.3	Wetland, Forest, Preservation	30.00	335.19	1005.57	10.06	3.35	3.35	3.35
	Agriculture	60.00	663.86	298737.00	570.92	6.64	6.64	6.64
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	1.00	11.17	4703.83	20.11	2.06	0.89	12.18
	Low Density Residential	5.00	54.73	11218.63	10.51	7.00	3.06	4.38
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	11.10	11724.77	11.88	29.98	4.44	23.32
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	8.47	2439.36	9.49	4.74	1.27	4.74
	Open Water	2.00	22.35	4134.01	2.90	0.89	0.89	0.89
	Extractive, Landfill	1.00	10.43	34887.95	0.93	0.10	0.10	0.10
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	1117.30	368851.12	636.79	54.77	20.66	55.60
Mill Creek 7B040 Area 205.9	Wetland, Forest, Preservation	24.00	49.42	148.25	1.48	0.49	0.49	0.49
	Agriculture	10.00	20.41	9184.50	17.55	0.20	0.20	0.20
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	65.00	133.58	27382.88	25.65	17.10	7.48	10.69
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.44	126.72	0.49	0.25	0.07	0.25
	Open Water	1.00	2.06	380.92	0.27	0.08	0.08	0.08
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	205.90	37223.26	45.44	18.12	8.33	11.71
Mill Creek 7C010 Area 281.8	Wetland, Forest, Preservation	2.00	5.64	16.91	0.17	0.06	0.06	0.06
	Agriculture	60.00	167.89	75550.50	144.39	1.68	1.68	1.68
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	28.00	78.02	15994.92	14.98	9.99	4.37	6.24
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	9.00	25.36	25438.09	55.80	145.32	15.72	65.94
	Arterial	0.00	2.07	596.16	2.32	1.16	0.31	1.16
	Open Water	1.00	2.82	521.33	0.37	0.11	0.11	0.11
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	281.80	118117.90	218.02	158.32	22.25	75.19
Mill Creek 7D010 Area 372.9	Wetland, Forest, Preservation	12.00	44.75	134.24	1.34	0.45	0.45	0.45
	Agriculture	43.00	157.82	71017.65	135.72	1.58	1.58	1.58
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	10.00	36.55	7492.75	7.02	4.68	2.05	2.92
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.34	961.92	3.74	1.87	0.50	1.87
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	35.00	130.45	436208.08	11.61	1.30	1.30	1.30
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	372.90	515814.64	159.43	9.88	5.88	8.12
			Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
PROJECT TOTALS FOR ALL SUBCATCHMENTS			23,643.87	9,508,127.72	12,668.40	6,330.20	1,446.92	7,168.66

Appendix ____
City of New Berlin - Stormwater Management Study
Unit Area Pollutant Loading Rates

Land Use Types	Unit Area Loading Rates				
	Sediment (lb./ac./yr.)	Phosphorous (lb./ac./yr.)	Lead (lb./ac./yr.)	Copper (lb./ac./yr.)	Zinc (lb./ac./yr.)
Wetland, Forest, Preservation ^a	3	0.03	0.010	0.010	0.010
Agriculture ^a	450	0.86	0.010	0.010	0.010
Park ^b	417	2.81	0.010	0.010	0.060
Institutional	421	1.80	0.184	0.080	1.090
Low Density Residential	205	0.19	0.128	0.056	0.080
Medium Density Residential	410	0.38	0.256	0.112	0.160
High Density Residential	574	0.52	0.360	0.160	0.224
Commercial ^c	1056	1.07	2.700	0.400	2.100
Industrial ^d	430	0.14	1.200	0.250	3.650
Highway ^e	1003	2.20	5.730	0.620	2.600
Arterial ^e	288	1.12	0.560	0.150	0.560
Open Water ^a	185	0.13	0.040	0.040	0.040
Extractive, Landfill	3344	0.09	0.010	0.010	0.010
Railroad	540	0.44	0.420	0.000	2.000

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4A010 Area 125.3	Wetland, Forest, Preservation	17.00	21.13	63.39	0.63	0.21	0.21	0.21
	Agriculture	50.00	61.37	27616.50	52.78	0.61	0.61	0.61
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	6.27	2637.57	11.28	1.15	0.50	6.83
	Low Density Residential	20.00	24.46	5014.30	4.70	3.13	1.37	1.96
	Medium Density Residential	8.00	9.51	3900.74	3.58	2.44	1.07	1.52
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.56	737.28	2.87	1.43	0.38	1.43
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	125.30	39969.78	75.83	8.98	4.15	12.57
Calhoun Creek 4A020 Area 180.3	Wetland, Forest, Preservation	20.00	35.88	107.64	1.08	0.36	0.36	0.36
	Agriculture	45.00	79.92	35961.75	68.73	0.80	0.80	0.80
	Park	10.00	17.93	7476.81	50.38	0.18	0.18	1.08
	Institutional	5.00	8.81	3706.91	15.85	1.62	0.70	9.60
	Low Density Residential	15.00	25.60	5246.98	4.91	3.28	1.43	2.05
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	8.95	9445.92	9.57	24.15	3.58	18.78
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.23	930.24	3.62	1.81	0.48	1.81
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	180.30	62876.24	154.14	32.19	7.54	34.47
Calhoun Creek 4A030 Area 88.2	Wetland, Forest, Preservation	5.00	4.39	13.17	0.13	0.04	0.04	0.04
	Agriculture	20.00	17.33	7798.50	14.90	0.17	0.17	0.17
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	75.00	65.36	13398.80	12.55	8.37	3.66	5.23
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.12	322.56	1.25	0.63	0.17	0.63
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	88.20	21533.03	28.84	9.21	4.05	6.07

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Calhoun Creek 4B010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	10.00	25.05	11272.50	21.54	0.25	0.25	0.25
Area 250.5	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	12.26	5159.36	22.06	2.25	0.98	13.36
	Low Density Residential	60.00	148.68	30479.40	28.55	19.03	8.33	11.89
	Medium Density Residential	2.00	5.01	2054.10	1.88	1.28	0.56	0.80
	High Density Residential	2.00	4.88	2801.12	2.54	1.76	0.78	1.09
	Commercial	20.00	49.43	52198.08	52.89	133.46	19.77	103.80
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.69	774.72	3.01	1.51	0.40	1.51
	Open Water	1.00	2.51	463.43	0.33	0.10	0.10	0.10
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	250.50	105202.70	132.80	159.64	31.17	132.81
Calhoun Creek 4B020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	16.00	35.98	16192.80	30.95	0.36	0.36	0.36
Area 224.9	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	10.00	22.49	9468.29	40.48	4.14	1.80	24.51
	Low Density Residential	70.00	156.60	32103.00	30.07	20.04	8.77	12.53
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	4.50	4749.89	4.81	12.14	1.80	9.45
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	2.00	4.50	4511.49	9.90	25.77	2.79	11.69
	Arterial	0.00	0.83	239.04	0.93	0.46	0.12	0.46
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	224.90	67264.51	117.13	62.93	15.64	59.01
Calhoun Creek 4C010	Wetland, Forest, Preservation	11.00	83.08	249.23	2.49	0.83	0.83	0.83
	Agriculture	20.00	151.30	68085.00	130.12	1.51	1.51	1.51
Area 756.5	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	22.70	9554.60	40.85	4.18	1.82	24.74
	Low Density Residential	20.00	149.86	30721.30	28.77	19.18	8.39	11.99
	Medium Density Residential	28.00	211.08	86542.80	79.37	54.04	23.64	33.77
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	74.48	78650.88	79.69	201.10	29.79	156.41
	Industrial	3.00	22.48	9664.25	3.03	26.97	5.62	82.03
	Highway	5.00	37.83	37938.48	83.22	216.74	23.45	98.35
	Arterial	0.00	3.71	1068.48	4.16	2.08	0.56	2.08
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	756.50	322475.01	451.70	526.62	95.61	411.71
Calhoun Creek 4C020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 74	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	38.00	26.55	28036.80	28.41	71.69	10.62	55.76
	Industrial	52.00	38.13	16395.90	5.15	45.76	9.53	139.17
	Highway	10.00	7.40	7422.20	16.28	42.40	4.59	19.24
	Arterial	0.00	1.92	552.96	2.15	1.08	0.29	1.08
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	74.00	52407.86	51.99	160.92	25.03	215.24

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Calhoun Creek 4C030	Wetland, Forest, Preservation	20.00	68.51	205.53	2.06	0.69	0.69	0.69
	Agriculture	5.00	16.90	7602.75	14.53	0.17	0.17	0.17
Area 345.9	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	17.00	56.56	11595.42	10.86	7.24	3.17	4.53
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	16.92	17862.24	18.10	45.67	6.77	35.52
	Industrial	38.00	129.24	55574.06	17.45	155.09	32.31	471.73
	Highway	15.00	51.89	52040.66	114.15	297.30	32.17	134.90
	Arterial	0.00	5.89	1696.32	6.60	3.30	0.88	3.30
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	345.90	146576.97	183.74	509.45	76.15	650.83
Calhoun Creek 4C040	Wetland, Forest, Preservation	15.00	33.62	100.85	1.01	0.34	0.34	0.34
	Agriculture	10.00	21.74	9783.00	18.70	0.22	0.22	0.22
Area 224.1	Park	10.00	22.05	9194.85	61.96	0.22	0.22	1.32
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	3.00	6.55	1343.37	1.26	0.84	0.37	0.52
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	4.31	4553.47	4.61	11.64	1.72	9.06
	Industrial	53.00	118.24	50844.49	15.96	141.89	29.56	431.59
	Highway	5.00	11.21	11238.62	24.65	64.20	6.95	29.13
	Arterial	0.00	1.90	547.20	2.13	1.06	0.29	1.06
	Open Water	2.00	4.48	829.17	0.58	0.18	0.18	0.18
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	224.10	88435.01	130.86	220.59	39.84	473.42
Calhoun Creek 4C050	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	30.00	24.70	11115.00	21.24	0.25	0.25	0.25
Area 84	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	70.00	58.80	12054.00	11.29	7.53	3.29	4.70
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.50	144.00	0.56	0.28	0.08	0.28
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	84.00	23313.00	33.09	8.05	3.61	5.23
Calhoun Creek 4C060	Wetland, Forest, Preservation	15.00	22.20	66.60	0.67	0.22	0.22	0.22
	Agriculture	30.00	43.66	19647.00	37.55	0.44	0.44	0.44
Area 148	Park	3.00	4.44	1851.48	12.48	0.04	0.04	0.27
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	33.00	48.76	9995.80	9.36	6.24	2.73	3.90
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	14.00	20.72	20782.16	45.58	118.73	12.85	53.87
	Arterial	0.00	0.82	236.16	0.92	0.46	0.12	0.46
	Open Water	5.00	7.40	1369.00	0.96	0.30	0.30	0.30
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	148.00	53948.20	107.52	126.43	16.70	59.45

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4C070 Area 408.9	Wetland, Forest, Preservation	20.00	81.78	245.34	2.45	0.82	0.82	0.82
	Agriculture	35.00	142.54	64140.75	122.58	1.43	1.43	1.43
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	8.06	3392.42	14.50	1.48	0.64	8.78
	Low Density Residential	28.00	111.71	22900.96	21.45	14.30	6.26	8.94
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	10.00	40.89	41012.67	89.96	234.30	25.35	106.31
	Arterial	0.00	3.48	1002.24	3.90	1.95	0.52	1.95
	Open Water	5.00	20.45	3782.33	2.66	0.82	0.82	0.82
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	408.90	136476.70	257.50	255.09	35.84	129.04
Calhoun Creek 4C080 Area 74	Wetland, Forest, Preservation	32.00	23.68	71.04	0.71	0.24	0.24	0.24
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	26.00	19.24	3944.20	3.69	2.46	1.08	1.54
	Medium Density Residential	12.00	8.88	3640.80	3.34	2.27	0.99	1.42
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	25.00	18.31	18364.93	40.28	104.92	11.35	47.61
	Arterial	0.00	0.19	54.72	0.21	0.11	0.03	0.11
	Open Water	5.00	3.70	684.50	0.48	0.15	0.15	0.15
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	74.00	26760.19	48.72	110.14	13.84	51.06
Calhoun Creek 4C085 Area 47	Wetland, Forest, Preservation	5.00	2.35	7.05	0.07	0.02	0.02	0.02
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	2.31	972.51	4.16	0.43	0.18	2.52
	Low Density Residential	85.00	39.11	8017.55	7.51	5.01	2.19	3.13
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	2.35	2357.05	5.17	13.47	1.46	6.11
	Arterial	0.00	0.88	253.44	0.99	0.49	0.13	0.49
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	47.00	11607.60	17.89	19.41	3.99	12.27
Calhoun Creek 4C090 Area 28.9	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	4.31	882.53	0.83	0.55	0.24	0.34
	Medium Density Residential	55.00	15.63	6406.25	5.88	4.00	1.75	2.50
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	30.00	8.67	1603.95	1.13	0.35	0.35	0.35
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	28.90	8979.13	8.16	5.07	2.38	3.36

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4C091 Area 65	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	8.00	5.02	2259.00	4.32	0.05	0.05	0.05
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	22.00	13.86	5835.06	24.95	2.55	1.11	15.11
	Low Density Residential	60.00	37.76	7740.80	7.25	4.83	2.11	3.02
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	6.41	6768.96	6.86	17.31	2.56	13.46
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.95	561.60	2.18	1.09	0.29	1.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	65.00	23165.42	45.56	25.83	6.13	32.73
Calhoun Creek 4D010 Area 133.8	Wetland, Forest, Preservation	20.00	26.76	80.28	0.80	0.27	0.27	0.27
	Agriculture	25.00	33.45	15052.50	28.77	0.33	0.33	0.33
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	40.00	53.35	10936.75	10.24	6.83	2.99	4.27
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	13.29	14034.24	14.22	35.88	5.32	27.91
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	6.69	6710.07	14.72	38.33	4.15	17.39
	Arterial	0.00	0.26	74.88	0.29	0.15	0.04	0.15
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	133.80	46888.72	69.04	81.79	13.09	50.32
Calhoun Creek 4E010 Area 317.4	Wetland, Forest, Preservation	18.00	57.13	171.40	1.71	0.57	0.57	0.57
	Agriculture	25.00	78.60	35370.00	67.60	0.79	0.79	0.79
	Park	2.00	6.35	2647.12	17.84	0.06	0.06	0.38
	Institutional	3.00	9.39	3954.03	16.91	1.73	0.75	10.24
	Low Density Residential	11.00	33.47	6862.17	6.43	4.28	1.87	2.68
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	6.28	6629.57	6.72	16.95	2.51	13.18
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	7.00	22.22	22284.65	48.88	127.31	13.78	57.77
	Arterial	0.00	2.39	688.32	2.68	1.34	0.36	1.34
	Open Water	2.00	6.35	1174.38	0.83	0.25	0.25	0.25
	Extractive, Landfill	30.00	95.22	318415.68	8.57	0.95	0.95	0.95
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	317.40	398197.32	178.15	154.24	21.90	88.15
Calhoun Creek 4E020 Area 21.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	83.00	17.49	17541.47	38.48	100.21	10.84	45.47
	Arterial	0.00	0.19	54.72	0.21	0.11	0.03	0.11
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	17.00	3.62	12108.62	0.33	0.04	0.04	0.04
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	21.30	29704.81	39.01	100.35	10.91	45.61

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Calhoun Creek 4E030 Area 600.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calhoun Creek 4E040 Area 42.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calhoun Creek 4E050 Area 29.9	Wetland, Forest, Preservation	20.00	5.98	17.94	0.18	0.06	0.06	0.06
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	39.00	11.64	2386.41	2.24	1.49	0.65	0.93
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	40.00	11.37	12006.72	12.17	30.70	4.55	23.88
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	1.00	0.30	299.90	0.66	1.71	0.19	0.78
	Arterial	0.00	0.61	175.68	0.68	0.34	0.09	0.34
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	29.90	14886.64	15.92	34.30	5.54	25.99
Calhoun Creek 4E060 Area 256.2	Forest, Preservation	5.00	12.68	38.04	0.38	0.13	0.13	0.13
	Agriculture	18.00	46.12	20752.20	39.66	0.46	0.46	0.46
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	25.00	62.88	12890.40	12.07	8.05	3.52	5.03
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.30	374.40	1.46	0.73	0.20	0.73
	Open Water	2.00	5.12	947.94	0.67	0.20	0.20	0.20
	Extractive, Landfill	50.00	128.10	428366.40	11.53	1.28	1.28	1.28
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	256.20	463369.38	65.76	10.85	5.79	7.83

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Calhoun Creek 4F010	Wetland, Forest, Preservation	8.00	19.41	58.22	0.58	0.19	0.19	0.19
	Agriculture	31.00	77.87	35042.40	66.97	0.78	0.78	0.78
Area 251.2	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	13.00	31.30	6415.68	6.01	4.01	1.75	2.50
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	10.00	25.12	25195.36	55.26	143.94	15.57	65.31
	Arterial	0.00	2.20	633.60	2.46	1.23	0.33	1.23
	Open Water	11.00	27.63	5111.92	3.59	1.11	1.11	1.11
	Extractive, Landfill	27.00	67.67	226301.86	6.09	0.68	0.68	0.68
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	251.20	298759.03	140.97	151.93	20.41	71.80
Upper Root River 2A010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 101.1	Park	70.00	70.47	29385.99	198.02	0.70	0.70	4.23
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	29.50	29.37	6021.77	5.64	3.76	1.64	2.35
	Medium Density Residential	0.50	0.51	207.26	0.19	0.13	0.06	0.08
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.75	216.00	0.84	0.42	0.11	0.42
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	101.10	35831.02	204.69	5.01	2.52	7.08
Upper Root River 2A015	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 64.6	Park	40.00	25.66	10700.22	72.10	0.26	0.26	1.54
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	60.00	38.72	15875.20	14.56	9.91	4.34	6.20
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.22	63.36	0.25	0.12	0.03	0.12
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	64.60	26638.78	86.91	10.29	4.63	7.86
Upper Root River 2A020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 105.3	Park	0.50	0.53	219.55	1.48	0.01	0.01	0.03
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	32.00	33.70	6907.68	6.47	4.31	1.89	2.70
	Medium Density Residential	52.50	55.28	22665.83	20.79	14.15	6.19	8.85
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	5.27	5559.84	5.63	14.22	2.11	11.06
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.17	48.96	0.19	0.10	0.03	0.10
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	10.00	10.36	5594.40	4.56	4.35	0.00	20.72
	<i>Subtotal</i>	100.00	105.30	40996.26	39.12	37.13	10.22	43.44

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Upper Root River 2A030	Wetland, Forest, Preservation	30.00	44.40	133.20	1.33	0.44	0.44	0.44
Area 148	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	27.00	39.96	8191.80	7.67	5.11	2.24	3.20
	Medium Density Residential	43.00	63.64	26092.40	23.93	16.29	7.13	10.18
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	148.00	34417.40	32.93	21.85	9.81	13.82
Upper Root River 2A040	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 79.7	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	15.00	11.81	4969.91	21.25	2.17	0.94	12.87
	Low Density Residential	30.00	23.84	4887.20	4.58	3.05	1.34	1.91
	Medium Density Residential	55.00	43.32	17759.15	16.29	11.09	4.85	6.93
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.74	213.12	0.83	0.41	0.11	0.41
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	79.70	27829.38	42.94	16.73	7.24	22.12
Upper Root River 2A050	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 189.8	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	15.00	28.47	11871.99	80.00	0.28	0.28	1.71
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	40.55	76.96	15777.60	14.78	9.85	4.31	6.16
	Medium Density Residential	18.15	34.14	13996.87	12.84	8.74	3.82	5.46
	High Density Residential	12.30	23.22	13325.64	12.07	8.36	3.71	5.20
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	4.00	7.59	3264.56	1.02	9.11	1.90	27.71
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.44	126.72	0.49	0.25	0.07	0.25
	Open Water	3.00	5.69	1053.39	0.74	0.23	0.23	0.23
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	7.00	13.29	7174.44	5.85	5.58	0.00	26.57
	Subtotal	100.00	189.80	66591.21	127.79	42.40	14.32	73.28
Upper Root River 2A060	Wetland, Forest, Preservation	1.00	2.92	8.77	0.09	0.03	0.03	0.03
Area 295.2	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	14.00	41.33	17233.78	116.13	0.41	0.41	2.48
	Institutional	7.00	20.58	8665.86	37.05	3.79	1.65	22.44
	Low Density Residential	67.00	196.22	40225.92	37.68	25.12	10.99	15.70
	Medium Density Residential	8.00	23.62	9682.56	8.88	6.05	2.64	3.78
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.67	480.96	1.87	0.94	0.25	0.94
	Open Water	3.00	8.86	1638.36	1.15	0.35	0.35	0.35
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	295.20	77936.21	202.85	36.68	16.33	45.71

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2B010 Area 106.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	30.00	31.85	13281.45	89.50	0.32	0.32	1.91
	Institutional	2.00	2.05	864.73	3.70	0.38	0.16	2.24
	Low Density Residential	52.00	54.33	11138.47	10.43	6.95	3.04	4.35
	Medium Density Residential	5.00	5.20	2132.00	1.96	1.33	0.58	0.83
	High Density Residential	7.00	7.32	4203.98	3.81	2.64	1.17	1.64
	Commercial	4.00	4.25	4485.89	4.55	11.47	1.70	8.92
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.19	342.72	1.33	0.67	0.18	0.67
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	106.20	36449.24	115.27	23.76	7.16	20.56
Upper Root River 2B012 Area 22.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	95.00	20.58	8435.75	7.74	5.27	2.30	3.29
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	1.09	1145.76	1.16	2.93	0.43	2.28
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.64	184.32	0.72	0.36	0.10	0.36
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	22.30	9765.83	9.61	8.56	2.83	5.93
Upper Root River 2B013 Area 25.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	100.00	25.60	10496.00	9.63	6.55	2.87	4.10
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	25.60	10496.00	9.63	6.55	2.87	4.10
Upper Root River 2B014 Area 67.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	75.00	50.22	20590.20	18.88	12.86	5.62	8.04
	High Density Residential	15.00	10.11	5803.14	5.26	3.64	1.62	2.26
	Commercial	10.00	6.41	6768.96	6.86	17.31	2.56	13.46
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.66	190.08	0.74	0.37	0.10	0.37
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	67.40	33352.38	31.74	34.17	9.91	24.13

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Upper Root River 2B015	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 42.7	Park	8.00	3.42	1424.47	9.60	0.03	0.03	0.20
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	92.00	38.65	15848.14	14.53	9.90	4.33	6.18
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.63	181.44	0.71	0.35	0.09	0.35
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	42.70	17454.05	24.84	10.28	4.46	6.74
Upper Root River 2B020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 83.5	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	12.00	9.63	4054.23	17.33	1.77	0.77	10.50
	Low Density Residential	30.00	24.29	4979.45	4.66	3.11	1.36	1.94
	Medium Density Residential	38.00	30.77	12615.70	11.57	7.88	3.45	4.92
	High Density Residential	18.00	14.88	8541.12	7.74	5.36	2.38	3.33
	Commercial	2.00	1.48	1562.88	1.58	4.00	0.59	3.11
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.45	705.60	2.74	1.37	0.37	1.37
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	83.50	32458.98	45.63	23.48	8.92	25.18
Upper Root River 2B030	Wetland, Forest, Preservation	20.00	15.18	45.54	0.46	0.15	0.15	0.15
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 75.9	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	77.00	57.56	23600.83	21.64	14.74	6.45	9.21
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.25	2372.83	2.40	6.07	0.90	4.72
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.91	262.08	1.02	0.51	0.14	0.51
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	75.90	26281.28	25.52	21.46	7.63	14.59
Upper Root River 2B040	Wetland, Forest, Preservation	8.00	5.46	16.39	0.16	0.05	0.05	0.05
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 68.3	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	92.00	62.84	25762.76	23.63	16.09	7.04	10.05
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	68.30	25779.15	23.79	16.14	7.09	10.11

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2B050	Wetland, Forest, Preservation	2.00	4.96	14.89	0.15	0.05	0.05	0.05
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 249.1	Park	7.00	17.44	7271.23	49.00	0.17	0.17	1.05
	Institutional	15.00	36.90	15532.80	66.41	6.79	2.95	40.22
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	36.00	89.05	36508.86	33.48	22.80	9.97	14.25
	High Density Residential	27.00	66.96	38433.32	34.82	24.10	10.71	15.00
	Commercial	10.00	24.04	25386.24	25.72	64.91	9.62	50.48
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.29	659.52	2.56	1.28	0.34	1.28
	Open Water	3.00	7.47	1382.51	0.97	0.30	0.30	0.30
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	249.10	125189.35	213.12	120.40	34.12	122.62
Upper Root River 2B060	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 248.6	Park	5.00	12.43	5183.31	34.93	0.12	0.12	0.75
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	50.00	123.30	50553.00	46.36	31.56	13.81	19.73
	High Density Residential	35.00	85.64	49157.36	44.53	30.83	13.70	19.18
	Commercial	10.00	24.28	25639.68	25.98	65.56	9.71	50.99
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.95	849.60	3.30	1.65	0.44	1.65
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	248.60	131382.95	155.11	129.73	37.79	92.30
Upper Root River 2C010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 200.7	Park	5.00	10.04	4184.60	28.20	0.10	0.10	0.60
	Institutional	10.00	20.07	8449.47	36.13	3.69	1.61	21.88
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	58.00	114.78	47058.16	43.16	29.38	12.85	18.36
	High Density Residential	17.00	33.77	19383.41	17.56	12.16	5.40	7.56
	Commercial	10.00	19.30	20380.80	20.65	52.11	7.72	40.53
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.75	792.00	3.08	1.54	0.41	1.54
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	200.70	100248.43	148.77	98.98	28.10	90.48
Upper Root River 2D010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 162.3	Park	5.00	8.12	3383.96	22.80	0.08	0.08	0.49
	Institutional	12.00	18.84	7929.96	33.90	3.47	1.51	20.53
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	83.00	133.06	54554.19	50.03	34.06	14.90	21.29
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.29	659.52	2.56	1.28	0.34	1.28
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	162.30	66527.62	109.30	38.89	16.83	43.59

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2D020 Area 265.2	Wetland, Forest, Preservation	11.00	29.17	87.52	0.88	0.29	0.29	0.29
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	5.30	2232.98	9.55	0.98	0.42	5.78
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	87.00	228.99	93887.54	86.10	58.62	25.65	36.64
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.73	498.24	1.94	0.97	0.26	0.97
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	265.20	96706.28	98.46	60.86	26.62	43.68
Upper Root River 2D030 Area 75.1	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	100.00	74.76	30651.60	28.11	19.14	8.37	11.96
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.34	97.92	0.38	0.19	0.05	0.19
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	75.10	30749.52	28.49	19.33	8.42	12.15
Upper Root River 2D031 Area 33.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	100.00	33.20	6806.00	6.37	4.25	1.86	2.66
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	33.20	6806.00	6.37	4.25	1.86	2.66
Upper Root River 2D032 Area 52.7	Wetland, Forest, Preservation	3.00	1.58	4.74	0.05	0.02	0.02	0.02
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	5.00	2.64	1098.80	7.40	0.03	0.03	0.16
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	92.00	48.48	19878.44	18.23	12.41	5.43	7.76
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	52.70	20981.98	25.68	12.45	5.47	7.93

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2D040 Area 173.6	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	8.50	3578.50	15.30	1.56	0.68	9.27
	Low Density Residential	38.00	64.89	13302.04	12.46	8.31	3.63	5.19
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	29.00	49.52	28426.78	25.75	17.83	7.92	11.09
	Commercial	8.00	13.29	14032.13	14.22	35.88	5.32	27.90
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	20.00	34.60	34703.80	76.12	198.26	21.45	89.96
	Arterial	0.00	2.80	806.40	3.14	1.57	0.42	1.57
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	173.60	94849.64	146.99	263.40	39.42	144.98
Upper Root River 2E010 Area 189.3	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	3.79	1593.91	6.81	0.70	0.30	4.13
	Low Density Residential	93.00	174.70	35813.30	33.54	22.36	9.78	13.98
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	9.47	9493.40	20.82	54.23	5.87	24.61
	Arterial	0.00	1.35	388.80	1.51	0.76	0.20	0.76
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	189.30	47289.40	62.69	78.05	16.16	43.47
Upper Root River 2E011 Area 98.2	Wetland, Forest, Preservation	13.00	12.77	38.30	0.38	0.13	0.13	0.13
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	2.00	1.79	748.10	5.04	0.02	0.02	0.11
	Institutional	15.00	14.19	5973.99	25.54	2.61	1.14	15.47
	Low Density Residential	44.00	41.17	8439.44	7.90	5.27	2.31	3.29
	Medium Density Residential	8.00	7.83	3208.66	2.94	2.00	0.88	1.25
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.81	2963.14	3.00	7.58	1.12	5.89
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	15.00	14.73	14774.19	32.41	84.40	9.13	38.30
	Arterial	0.00	2.92	840.96	3.27	1.64	0.44	1.64
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	98.20	36986.77	80.49	103.64	15.16	66.07
Upper Root River 2E020 Area 116.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	8.00	9.26	3896.78	16.66	1.70	0.74	10.09
	Low Density Residential	87.00	100.84	20672.00	19.36	12.91	5.65	8.07
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	5.00	5.84	5852.51	12.84	33.43	3.62	15.17
	Arterial	0.00	0.77	221.76	0.86	0.43	0.12	0.43
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	116.70	30643.04	49.72	48.48	10.12	33.76

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2E030 Area 39.9	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	100.00	39.90	8179.50	7.66	5.11	2.23	3.19
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	39.90	8179.50	7.66	5.11	2.23	3.19
Upper Root River 2E040 Area 11.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	100.00	11.40	2337.00	2.19	1.46	0.64	0.91
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	11.40	2337.00	2.19	1.46	0.64	0.91
Upper Root River 2E050 Area 42.7	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	100.00	42.70	8753.50	8.20	5.47	2.39	3.42
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	42.70	8753.50	8.20	5.47	2.39	3.42
Upper Root River 2E060 Area 169.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	96.00	161.49	33106.27	31.01	20.67	9.04	12.92
	Medium Density Residential	2.00	3.33	1364.48	1.25	0.85	0.37	0.53
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.19	342.72	1.33	0.67	0.18	0.67
	Open Water	2.00	3.39	626.78	0.44	0.14	0.14	0.14
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	169.40	35440.25	34.03	22.33	9.73	14.25

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Upper Root River 2E070 Area 64.1	Wetland, Forest, Preservation	25.00	16.03	48.08	0.48	0.16	0.16	0.16
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	2.00	1.28	534.59	3.60	0.01	0.01	0.08
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	43.00	27.25	5586.87	5.23	3.49	1.53	2.18
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.31	89.28	0.35	0.17	0.05	0.17
	Open Water	30.00	19.23	3557.55	2.50	0.77	0.77	0.77
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	64.10	9816.36	12.16	4.60	2.51	3.36
Upper Root River 2E071 Area 18.5	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	98.00	17.83	3655.15	3.42	2.28	1.00	1.43
	Medium Density Residential	2.00	0.30	123.00	0.11	0.08	0.03	0.05
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.37	106.56	0.41	0.21	0.06	0.21
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	18.50	3884.71	3.95	2.57	1.09	1.68
Upper Root River 2E080 Area 129	Wetland, Forest, Preservation	3.00	3.87	11.61	0.12	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	17.00	21.93	4495.65	4.21	2.81	1.23	1.75
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	50.00	64.05	36764.70	33.31	23.06	10.25	14.35
	Commercial	30.00	38.25	40392.00	40.93	103.28	15.30	80.33
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.90	259.20	1.01	0.50	0.14	0.50
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	129.00	81923.16	79.57	129.68	26.95	96.97
Upper Root River 2E090 Area 155.1	Wetland, Forest, Preservation	50.00	77.55	232.65	2.33	0.78	0.78	0.78
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	45.00	68.99	14141.93	13.25	8.83	3.86	5.52
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.81	233.28	0.91	0.45	0.12	0.45
	Open Water	5.00	7.76	1434.68	1.01	0.31	0.31	0.31
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	155.10	16042.53	17.49	10.37	5.07	7.06

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses		Total Loadings						
			Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
			(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Upper Root River 2F010 Area 135.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Low Density Residential	55.00	73.68	15104.40	14.15	9.43	4.13	5.89	
	Medium Density Residential	35.00	46.87	19216.70	17.62	12.00	5.25	7.50	
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway	10.00	13.52	13560.56	29.74	77.47	8.38	35.15	
	Arterial	0.00	1.13	325.44	1.27	0.63	0.17	0.63	
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal	100.00	135.20	48207.10	62.78	99.53	17.93	49.18	
	Tess Corners Creek 5A010 Area 234.8	Wetland, Forest, Preservation	30.00	70.33	210.99	2.11	0.70	0.70	0.70
Agriculture		1.00	2.14	962.10	1.84	0.02	0.02	0.02	
Park		20.00	46.90	19557.30	131.79	0.47	0.47	2.81	
	Institutional	5.00	11.68	4917.28	21.02	2.15	0.93	12.73	
	Low Density Residential	41.00	94.57	19386.44	18.16	12.10	5.30	7.57	
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial	3.00	6.97	7364.54	7.46	18.83	2.79	14.65	
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial	0.00	2.21	636.48	2.48	1.24	0.33	1.24	
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal	100.00	234.80	53035.13	184.86	35.51	10.54	39.72	
	Tess Corners Creek 5A020 Area 1337.9	Wetland, Forest, Preservation	25.00	333.78	1001.33	10.01	3.34	3.34	3.34
Agriculture		52.00	691.99	311394.60	595.11	6.92	6.92	6.92	
Park		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Institutional	2.00	26.54	11172.50	47.77	4.88	2.12	28.93	
	Low Density Residential	10.00	129.11	26467.55	24.79	16.53	7.23	10.33	
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial	3.00	40.03	42268.51	42.83	108.07	16.01	84.06	
	Industrial	6.00	78.89	33924.42	10.65	94.67	19.72	287.96	
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial	0.00	10.81	3113.28	12.11	6.05	1.62	6.05	
	Open Water	2.00	26.76	4950.23	3.48	1.07	1.07	1.07	
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal	100.00	1337.90	434292.42	746.75	241.54	58.04	428.66	
	Tess Corners Creek 5A030 Area 49.8	Wetland, Forest, Preservation	12.00	5.98	17.93	0.18	0.06	0.06	0.06
Agriculture		10.00	4.88	2196.00	4.20	0.05	0.05	0.05	
Park		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Low Density Residential	73.00	34.89	7153.27	6.70	4.47	1.95	2.79	
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Commercial	5.00	2.36	2492.16	2.53	6.37	0.94	4.96	
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Arterial	0.00	1.69	486.72	1.89	0.95	0.25	0.95	
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Subtotal	100.00	49.80	12346.08	15.49	11.89	3.26	8.80	

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Tess Corners Creek 5A031	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 84.5	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	75.00	62.52	12815.58	12.00	8.00	3.50	5.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	20.00	16.79	9637.46	8.73	6.04	2.69	3.76
	Commercial	5.00	4.12	4345.44	4.40	11.11	1.65	8.64
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.08	311.04	1.21	0.60	0.16	0.60
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	84.50	27109.52	26.35	25.76	8.00	18.01
Underwood Creek 1A010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 160.4	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	1.00	1.51	637.39	2.73	0.28	0.12	1.65
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	88.00	139.25	57093.32	52.36	35.65	15.60	22.28
	High Density Residential	2.00	3.00	1720.85	1.56	1.08	0.48	0.67
	Commercial	2.00	3.12	3292.61	3.34	8.42	1.25	6.55
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.46	708.48	2.76	1.38	0.37	1.38
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	7.00	11.06	5971.32	4.87	4.64	0.00	22.12
	Subtotal	100.00	160.40	69423.97	67.60	51.45	17.81	54.64
Underwood Creek 1A020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 26.13	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	90.00	22.85	4683.64	4.39	2.92	1.28	1.83
	Medium Density Residential	10.00	2.54	1042.63	0.96	0.65	0.28	0.41
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.74	213.12	0.83	0.41	0.11	0.41
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	26.13	5939.39	6.17	3.99	1.68	2.65
Underwood Creek 1A030	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 128.1	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTSIDE STUDY AREA								
	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Underwood Creek 1A031 Area 179.6	Wetland, Forest, Preservation	2.00	3.59	10.78	0.11	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	34.00	60.96	25665.84	109.74	11.22	4.88	66.45
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	57.00	101.35	41554.32	38.11	25.95	11.35	16.22
	High Density Residential	2.00	3.52	2021.63	1.83	1.27	0.56	0.79
	Commercial	3.00	5.23	5520.77	5.59	14.12	2.09	10.98
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.35	388.80	1.51	0.76	0.20	0.76
	Open Water	2.00	3.59	664.52	0.47	0.14	0.14	0.14
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	179.60	75826.66	157.36	53.48	19.27	95.37
Underwood Creek 1A032 Area 95.84	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	10.00	9.56	3988.19	26.87	0.10	0.10	0.57
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	40.00	38.34	7858.88	7.36	4.91	2.15	3.07
	Medium Density Residential	44.00	41.55	17035.34	15.62	10.64	4.65	6.65
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	6.00	5.55	5861.22	5.94	14.99	2.22	11.66
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.84	241.92	0.94	0.47	0.13	0.47
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	95.84	34985.55	56.74	31.10	9.24	22.41
Deer Creek 3A010 Area 343.5	Wetland, Forest, Preservation	13.00	44.66	133.97	1.34	0.45	0.45	0.45
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	8.80	29.39	12254.80	82.58	0.29	0.29	1.76
	Institutional	16.00	54.81	23075.01	98.66	10.09	4.38	59.74
	Low Density Residential	4.00	13.60	2788.00	2.61	1.74	0.76	1.09
	Medium Density Residential	27.60	94.00	38538.36	35.34	24.06	10.53	15.04
	High Density Residential	21.00	70.85	40665.03	36.84	25.50	11.34	15.87
	Commercial	1.60	5.20	5486.98	5.56	14.03	2.08	10.91
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.53	1016.64	3.95	1.98	0.53	1.98
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	8.00	27.48	14839.20	12.09	11.54	0.00	54.96
	Subtotal	100.00	343.50	138797.98	278.98	89.68	30.36	161.80
Deer Creek 3A011 Area 14.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	80.00	11.04	4647.84	19.87	2.03	0.88	12.03
	Low Density Residential	18.00	2.52	515.78	0.48	0.32	0.14	0.20
	Medium Density Residential	1.00	0.14	58.22	0.05	0.04	0.02	0.02
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	0.07	76.03	0.08	0.19	0.03	0.15
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.43	123.84	0.48	0.24	0.06	0.24
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	14.20	5421.71	20.97	2.82	1.13	12.65

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Deer Creek 3A020 Area 210.8	Wetland, Forest, Preservation	9.00	18.97	56.92	0.57	0.19	0.19	0.19
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.80	43.53	8922.91	8.36	5.57	2.44	3.48
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	2.00	3.99	2287.96	2.07	1.43	0.64	0.89
	Commercial	2.00	4.05	4272.58	4.33	10.92	1.62	8.50
	Industrial	62.20	130.22	55993.57	17.58	156.26	32.55	475.29
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.79	515.52	2.00	1.00	0.27	1.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	4.00	8.26	4461.48	3.64	3.47	0.00	16.52
	Subtotal	100.00	210.80	76510.94	38.55	178.85	37.71	505.88
Deer Creek 3A030 Area 162.1	Wetland, Forest, Preservation	2.00	3.24	9.73	0.10	0.03	0.03	0.03
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	7.00	11.22	4677.49	31.52	0.11	0.11	0.67
	Institutional	6.00	9.47	3985.19	17.04	1.74	0.76	10.32
	Low Density Residential	23.00	37.28	7643.02	7.16	4.77	2.09	2.98
	Medium Density Residential	36.00	57.43	23544.66	21.59	14.70	6.43	9.19
	High Density Residential	19.00	30.80	17678.63	16.02	11.09	4.93	6.90
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.32	380.16	1.48	0.74	0.20	0.74
	Open Water	7.00	11.35	2099.20	1.48	0.45	0.45	0.45
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	162.10	60018.06	96.38	33.64	15.00	31.29
Deer Creek 3A031 Area 60	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	9.00	5.40	1107.00	1.04	0.69	0.30	0.43
	Medium Density Residential	1.00	0.60	246.00	0.23	0.15	0.07	0.10
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	90.00	52.95	22768.50	7.15	63.54	13.24	193.27
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.05	302.40	1.18	0.59	0.16	0.59
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	60.00	24423.90	9.59	64.97	13.76	194.38
Deer Creek 3A032 Area 169.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	100.00	167.80	72154.00	22.65	201.36	41.95	612.47
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.60	460.80	1.79	0.90	0.24	0.90
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	169.40	72614.80	24.45	202.26	42.19	613.37

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Deer Creek 3A033	Wetland, Forest, Preservation	10.00	21.25	63.75	0.64	0.21	0.21	0.21
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 212.9	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	15.00	31.01	17796.87	16.12	11.16	4.96	6.95
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	75.00	156.97	67494.95	21.19	188.36	39.24	572.92
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.68	1059.84	4.12	2.06	0.55	2.06
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	212.90	86415.41	42.07	201.79	44.97	582.14
Deer Creek 3A040	Wetland, Forest, Preservation	23.00	62.42	187.27	1.87	0.62	0.62	0.62
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 271.4	Park	5.00	13.53	5642.01	38.02	0.14	0.14	0.81
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	40.67	8337.35	7.81	5.21	2.28	3.25
	Medium Density Residential	32.00	84.73	34738.48	31.86	21.69	9.49	13.56
	High Density Residential	19.00	51.14	29352.06	26.59	18.41	8.18	11.45
	Commercial	6.00	16.02	16921.34	17.15	43.26	6.41	33.65
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.89	832.32	3.24	1.62	0.43	1.62
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	271.40	96010.83	126.53	90.95	27.55	64.97
Deer Creek 3A041	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 10	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	100.00	9.75	10296.00	10.43	26.33	3.90	20.48
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.25	72.00	0.28	0.14	0.04	0.14
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	10.00	10368.00	10.71	26.47	3.94	20.62
Deer Creek 3A042	Wetland, Forest, Preservation	20.00	24.08	72.24	0.72	0.24	0.24	0.24
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 121	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	2.36	993.56	4.25	0.43	0.19	2.57
	Low Density Residential	50.00	60.50	12402.50	11.62	7.74	3.39	4.84
	Medium Density Residential	5.00	5.35	2193.50	2.01	1.37	0.60	0.86
	High Density Residential	3.00	3.40	1951.60	1.77	1.22	0.54	0.76
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	20.00	24.14	10380.20	3.26	28.97	6.04	88.11
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.17	336.96	1.31	0.66	0.18	0.66
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	121.00	28330.56	24.94	40.64	11.17	98.04

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Deer Creek 3A043 Area 123.4	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	12.08	12756.48	12.93	32.62	4.83	25.37
	Industrial	90.00	110.14	47360.20	14.87	132.17	27.54	402.01
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.18	339.84	1.32	0.66	0.18	0.66
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	123.40	60456.52	29.12	165.44	32.54	428.04
Deer Creek 3A044 Area 127.2	Wetland, Forest, Preservation	3.00	3.82	11.45	0.11	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	2.54	1071.02	4.58	0.47	0.20	2.77
	Low Density Residential	16.00	19.98	4096.31	3.84	2.56	1.12	1.60
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	12.14	12819.84	12.99	32.78	4.86	25.49
	Industrial	69.00	86.40	37151.14	11.66	103.68	21.60	315.35
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.32	668.16	2.60	1.30	0.35	1.30
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	127.20	55817.92	35.78	140.82	28.16	346.56
Deer Creek 3A050 Area 122.4	Wetland, Forest, Preservation	32.00	39.14	117.41	1.17	0.39	0.39	0.39
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	22.00	26.93	11040.48	10.12	6.89	3.02	4.31
	High Density Residential	7.00	8.30	4763.05	4.31	2.99	1.33	1.86
	Commercial	39.00	46.53	49131.46	49.78	125.62	18.61	97.70
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.51	434.88	1.69	0.85	0.23	0.85
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	122.40	65487.28	67.09	136.74	23.57	105.11
Deer Creek 3A060 Area 216.8	Wetland, Forest, Preservation	15.00	32.52	97.56	0.98	0.33	0.33	0.33
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	6.50	2738.18	11.71	1.20	0.52	7.09
	Low Density Residential	12.00	26.02	5333.28	5.00	3.33	1.46	2.08
	Medium Density Residential	35.00	75.11	30795.10	28.24	19.23	8.41	12.02
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	18.00	38.88	41061.50	41.61	104.99	15.55	81.66
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.91	262.08	1.02	0.51	0.14	0.51
	Open Water	2.00	4.34	802.16	0.56	0.17	0.17	0.17
	Extractive, Landfill	15.00	32.52	108746.88	2.93	0.33	0.33	0.33
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	216.80	189836.75	92.03	130.08	26.90	104.18

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Deer Creek 3A070 Area 429.8	Wetland, Forest, Preservation	7.00	30.09	90.26	0.90	0.30	0.30	0.30
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	6.00	25.79	10753.60	72.46	0.26	0.26	1.55
	Institutional	8.00	34.38	14475.66	61.89	6.33	2.75	37.48
	Low Density Residential	3.00	12.52	2567.42	2.40	1.60	0.70	1.00
	Medium Density Residential	63.00	268.25	109984.14	100.86	68.67	30.04	42.92
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	9.00	37.21	39295.87	39.82	100.47	14.88	78.15
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.36	1255.68	4.88	2.44	0.65	2.44
	Open Water	4.00	17.19	3180.52	2.23	0.69	0.69	0.69
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	429.80	181603.15	285.46	180.76	50.28	164.52
Deer Creek 3A080 Area 173.6	Wetland, Forest, Preservation	15.00	26.04	78.12	0.78	0.26	0.26	0.26
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	3.00	5.21	2171.74	14.63	0.05	0.05	0.31
	Institutional	33.00	57.29	24118.25	103.12	10.54	4.58	62.44
	Low Density Residential	27.00	46.87	9608.76	9.00	6.00	2.62	3.75
	Medium Density Residential	22.00	37.50	15375.82	14.10	9.60	4.20	6.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.69	198.72	0.77	0.39	0.10	0.39
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	173.60	51551.40	142.41	26.84	11.82	73.15
Poplar Creek 6A010 Area 610.6	Wetland, Forest, Preservation	40.00	242.88	728.64	7.29	2.43	2.43	2.43
	Agriculture	8.00	47.96	21581.10	41.24	0.48	0.48	0.48
	Park	15.00	91.19	38026.23	256.24	0.91	0.91	5.47
	Institutional	1.00	5.80	2440.12	10.43	1.07	0.46	6.32
	Low Density Residential	24.00	144.40	29602.82	27.73	18.48	8.09	11.55
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	5.93	6257.86	6.34	16.00	2.37	12.44
	Industrial	10.00	60.97	26217.10	8.23	73.16	15.24	222.54
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	5.37	1546.56	6.01	3.01	0.81	3.01
	Open Water	1.00	6.11	1129.61	0.79	0.24	0.24	0.24
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	610.60	127530.03	364.31	115.79	31.03	264.49
Poplar Creek 6A011 Area 405.2	Wetland, Forest, Preservation	8.00	32.39	97.16	0.97	0.32	0.32	0.32
	Agriculture	6.00	24.31	10940.40	20.91	0.24	0.24	0.24
	Park	25.00	100.76	42016.92	283.14	1.01	1.01	6.05
	Institutional	3.00	12.05	5071.37	21.68	2.22	0.96	13.13
	Low Density Residential	50.00	199.34	40864.70	38.27	25.52	11.16	15.95
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.01	1154.88	4.49	2.25	0.60	2.25
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	8.00	32.35	108165.02	2.91	0.32	0.32	0.32
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	405.20	208310.45	372.37	31.88	14.63	38.26

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Poplar Creek 6A020 Area 313.1	Wetland, Forest, Preservation	46.00	143.70	431.09	4.31	1.44	1.44	1.44
	Agriculture	5.00	15.00	6747.75	12.90	0.15	0.15	0.15
	Park	3.00	9.06	3779.27	25.47	0.09	0.09	0.54
	Institutional	5.00	15.44	6498.14	27.78	2.84	1.23	16.82
	Low Density Residential	7.00	21.26	4357.69	4.08	2.72	1.19	1.70
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	18.00	56.25	32286.35	29.25	20.25	9.00	12.60
	Commercial	5.00	15.33	16183.20	16.40	41.38	6.13	32.18
	Industrial	10.00	31.31	13463.30	4.23	37.57	7.83	114.28
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.64	760.32	2.96	1.48	0.40	1.48
	Open Water	1.00	3.13	579.24	0.41	0.13	0.13	0.13
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	313.10	85086.34	127.78	108.04	27.58	181.32
Poplar Creek 6A021 Area 136.6	Wetland, Forest, Preservation	37.00	50.06	150.19	1.50	0.50	0.50	0.50
	Agriculture	5.00	6.83	3073.50	5.87	0.07	0.07	0.07
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	8.00	10.52	2156.19	2.02	1.35	0.59	0.84
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	50.00	67.82	29162.60	9.16	81.38	16.96	247.54
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.37	394.56	1.53	0.77	0.21	0.77
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	136.60	34937.04	20.09	84.07	18.32	249.72
Poplar Creek 6A022 Area 71.2	Wetland, Forest, Preservation	3.00	2.14	6.41	0.06	0.02	0.02	0.02
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	28.00	19.82	8342.54	35.67	3.65	1.59	21.60
	Low Density Residential	67.00	47.58	9754.72	9.14	6.09	2.66	3.81
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.24	69.12	0.27	0.13	0.04	0.13
	Open Water	2.00	1.42	263.44	0.19	0.06	0.06	0.06
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	71.20	18436.22	45.32	9.95	4.36	25.62
Poplar Creek 6A023 Area 333.1	Wetland, Forest, Preservation	30.00	99.93	299.79	3.00	1.00	1.00	1.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	16.66	7011.76	29.98	3.06	1.33	18.15
	Low Density Residential	65.00	214.57	43985.83	41.20	27.46	12.02	17.17
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.95	561.60	2.18	1.09	0.29	1.09
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	333.10	51858.97	76.36	32.62	14.64	37.41

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Poplar Creek	Wetland, Forest, Preservation	23.00	24.85	74.54	0.75	0.25	0.25	0.25
6A030	Agriculture	40.00	43.16	19422.00	37.12	0.43	0.43	0.43
Area	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108.2	Institutional	17.00	18.18	7655.46	32.73	3.35	1.45	19.82
	Low Density Residential	10.00	10.31	2113.55	1.98	1.32	0.58	0.82
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	10.00	10.26	10834.56	10.98	27.70	4.10	21.55
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.44	414.72	1.61	0.81	0.22	0.81
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	108.20	40514.83	85.16	33.85	7.03	43.68
Poplar Creek	Wetland, Forest, Preservation	25.00	39.98	119.93	1.20	0.40	0.40	0.40
6A040	Agriculture	52.00	82.88	37295.10	71.28	0.83	0.83	0.83
Area	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
159.9	Institutional	5.00	8.00	3365.90	14.39	1.47	0.64	8.71
	Low Density Residential	18.00	28.75	5894.16	5.52	3.68	1.61	2.30
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	159.90	46761.48	92.72	6.55	3.52	12.41
Poplar Creek	Wetland, Forest, Preservation	20.00	73.91	221.73	2.22	0.74	0.74	0.74
6A041	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
372.9	Institutional	10.00	37.14	15635.94	66.85	6.83	2.97	40.48
	Low Density Residential	15.00	55.33	11341.63	10.62	7.08	3.10	4.43
	Medium Density Residential	27.00	99.22	40681.43	37.31	25.40	11.11	15.88
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	5.00	17.62	18601.44	18.85	47.56	7.05	36.99
	Industrial	22.00	80.87	34773.24	10.92	97.04	20.22	295.17
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	5.09	1465.92	5.70	2.85	0.76	2.85
	Open Water	1.00	3.73	689.87	0.48	0.15	0.15	0.15
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	372.90	123411.19	152.95	187.66	46.10	396.68
Poplar Creek	Wetland, Forest, Preservation	25.00	19.58	58.73	0.59	0.20	0.20	0.20
6A042	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78.3	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	47.00	36.80	7544.21	7.07	4.71	2.06	2.94
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	28.00	21.92	9427.32	2.96	26.31	5.48	80.02
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	78.30	17030.25	10.61	31.22	7.74	83.16

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6A043 Area 44.1	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	5.00	2.21	452.03	0.42	0.28	0.12	0.18
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	95.00	41.60	17885.85	5.62	49.91	10.40	151.82
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.30	86.40	0.34	0.17	0.05	0.17
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	44.10	18424.28	6.37	50.36	10.57	152.17
Poplar Creek 6A044 Area 79.7	Wetland, Forest, Preservation	5.00	3.99	11.96	0.12	0.04	0.04	0.04
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	95.00	75.11	32295.15	10.14	90.13	18.78	274.13
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.61	175.68	0.68	0.34	0.09	0.34
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	79.70	32482.79	10.94	90.51	18.91	274.51
Poplar Creek 6A050 Area 92.5	Wetland, Forest, Preservation	5.00	4.50	13.49	0.13	0.04	0.04	0.04
	Agriculture	80.00	72.90	32805.00	62.69	0.73	0.73	0.73
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	15.00	13.36	2737.78	2.56	1.71	0.75	1.07
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.75	504.00	1.96	0.98	0.26	0.98
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	92.50	36060.26	67.35	3.46	1.78	2.82
Poplar Creek 6A060 Area 567.9	Wetland, Forest, Preservation	25.00	139.94	419.81	4.20	1.40	1.40	1.40
	Agriculture	10.00	56.08	25236.00	48.23	0.56	0.56	0.56
	Park	20.00	113.58	47362.86	319.16	1.14	1.14	6.81
	Institutional	15.00	84.57	35601.87	152.22	15.56	6.77	92.18
	Low Density Residential	29.00	163.67	33552.56	31.42	20.95	9.17	13.09
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	5.64	5954.78	6.03	15.23	2.26	11.84
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.43	1275.84	4.96	2.48	0.66	2.48
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	567.90	149403.71	566.22	57.31	21.95	128.37

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6A070 Area 116.8	Wetland, Forest, Preservation	35.00	40.88	122.64	1.23	0.41	0.41	0.41
	Agriculture	15.00	17.52	7884.00	15.07	0.18	0.18	0.18
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	50.00	58.33	11957.65	11.20	7.47	3.27	4.67
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.07	20.16	0.08	0.04	0.01	0.04
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	116.80	19984.45	27.57	8.09	3.86	5.29
Poplar Creek 6A071 Area 680.8	Wetland, Forest, Preservation	37.00	251.90	755.69	7.56	2.52	2.52	2.52
	Agriculture	20.00	136.08	61236.00	117.03	1.36	1.36	1.36
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	35.00	237.21	48628.05	45.54	30.36	13.28	18.98
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.19	342.72	1.33	0.67	0.18	0.67
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	8.00	54.42	181993.86	4.90	0.54	0.54	0.54
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	680.80	292956.31	176.36	35.45	17.89	24.07
Poplar Creek 6A072 Area 786.6	Wetland, Forest, Preservation	55.00	431.74	1295.22	12.95	4.32	4.32	4.32
	Agriculture	5.00	39.33	17698.50	33.82	0.39	0.39	0.39
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	3.00	23.02	9690.58	41.43	4.24	1.84	25.09
	Low Density Residential	30.00	231.58	47473.90	44.46	29.64	12.97	18.53
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	7.00	53.72	56730.43	57.48	145.05	21.49	112.82
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	7.21	2076.48	8.08	4.04	1.08	4.04
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	786.60	134965.11	198.23	187.68	42.09	165.18
Poplar Creek 6B010 Area 279.9	Wetland, Forest, Preservation	56.00	156.59	469.78	4.70	1.57	1.57	1.57
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	5.54	2331.50	9.97	1.02	0.44	6.04
	Low Density Residential	20.00	54.17	11104.85	10.40	6.93	3.03	4.33
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	5.53	5837.57	5.91	14.93	2.21	11.61
	Industrial	15.00	41.99	18053.55	5.67	50.38	10.50	153.25
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	2.09	601.92	2.34	1.17	0.31	1.17
	Open Water	5.00	14.00	2589.08	1.82	0.56	0.56	0.56
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	279.90	40988.24	40.81	76.56	18.62	178.52

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6B020 Area 349.7	Wetland, Forest, Preservation	25.00	87.43	262.28	2.62	0.87	0.87	0.87
	Agriculture	10.00	34.80	15660.00	29.93	0.35	0.35	0.35
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	63.00	219.48	44993.61	42.14	28.09	12.29	17.56
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.00	288.00	1.12	0.56	0.15	0.56
	Open Water	2.00	6.99	1293.89	0.91	0.28	0.28	0.28
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	349.70	62497.77	76.72	30.16	13.94	19.62
Poplar Creek 6B030 Area 325.9	Wetland, Forest, Preservation	13.00	42.37	127.10	1.27	0.42	0.42	0.42
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	30.00	97.51	40661.67	274.00	0.98	0.98	5.85
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	42.00	134.46	27563.89	25.82	17.21	7.53	10.76
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	2.00	6.37	6724.61	6.81	17.19	2.55	13.37
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	3.20	921.60	3.58	1.79	0.48	1.79
	Open Water	3.00	9.78	1808.75	1.27	0.39	0.39	0.39
	Extractive, Landfill	10.00	32.22	107743.68	2.90	0.32	0.32	0.32
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	325.90	185551.29	315.66	38.31	12.67	32.91
Poplar Creek 6B040 Area 210.2	Wetland, Forest, Preservation	60.00	126.05	378.15	3.78	1.26	1.26	1.26
	Agriculture	13.00	27.26	12265.20	23.44	0.27	0.27	0.27
	Park	5.00	10.51	4382.67	29.53	0.11	0.11	0.63
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	22.00	45.69	9367.27	8.77	5.85	2.56	3.66
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.69	198.72	0.77	0.39	0.10	0.39
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	210.20	26592.01	66.30	7.87	4.30	6.21
Poplar Creek 6B050 Area 119.6	Wetland, Forest, Preservation	75.00	89.11	267.33	2.67	0.89	0.89	0.89
	Agriculture	5.00	5.84	2628.00	5.02	0.06	0.06	0.06
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	20.00	23.04	4723.20	4.42	2.95	1.29	1.84
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.61	463.68	1.80	0.90	0.24	0.90
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	119.60	8082.21	13.92	4.80	2.48	3.69

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area (%total)	Area (acres)	Sediment (lb./yr.)	Phosphorous (lb./yr.)	Lead (lb./yr.)	Copper (lb./yr.)	Zinc (lb./yr.)
Poplar Creek 6C010 Area 753.5	Wetland, Forest, Preservation	37.00	278.29	834.86	8.35	2.78	2.78	2.78
	Agriculture	8.00	59.05	26572.50	50.78	0.59	0.59	0.59
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	5.00	37.51	15789.61	67.51	6.90	3.00	40.88
	Low Density Residential	20.00	148.83	30510.15	28.58	19.05	8.33	11.91
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	6.00	44.87	47382.72	48.01	121.15	17.95	94.23
	Industrial	14.00	104.47	44922.10	14.10	125.36	26.12	381.32
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	5.14	1480.32	5.76	2.88	0.77	2.88
	Open Water	5.00	37.68	6969.88	4.90	1.51	1.51	1.51
	Extractive, Landfill	5.00	37.68	125985.20	3.39	0.38	0.38	0.38
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	753.50	300447.33	231.38	280.60	61.43	536.46
Poplar Creek 6C020 Area 317.4	Wetland, Forest, Preservation	43.90	138.60	415.80	4.16	1.39	1.39	1.39
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	26.10	82.75	16964.04	15.89	10.59	4.63	6.62
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	8.00	25.39	14575.01	13.20	9.14	4.06	5.69
	Commercial	3.00	9.43	9960.19	10.09	25.47	3.77	19.81
	Industrial	4.00	12.70	5459.28	1.71	15.24	3.17	46.34
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.92	264.96	1.03	0.52	0.14	0.52
	Open Water	2.00	6.35	1174.38	0.83	0.25	0.25	0.25
	Extractive, Landfill	10.00	31.74	106138.56	2.86	0.32	0.32	0.32
	Railroad	3.00	9.52	5141.88	4.19	4.00	0.00	19.04
	<i>Subtotal</i>	100.00	317.40	160094.09	53.96	66.91	17.74	99.97
Poplar Creek 6C021 Area 145.7	Wetland, Forest, Preservation	12.00	17.48	52.45	0.52	0.17	0.17	0.17
	Agriculture	35.00	51.00	22947.75	43.86	0.51	0.51	0.51
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	2.91	1226.79	5.25	0.54	0.23	3.18
	Low Density Residential	45.00	65.57	13440.83	12.59	8.39	3.67	5.25
	Medium Density Residential	6.00	7.69	3153.72	2.89	1.97	0.86	1.23
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.05	302.40	1.18	0.59	0.16	0.59
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	145.70	41123.94	66.28	12.17	5.61	10.92
Poplar Creek 6C022 Area 292.3	Wetland, Forest, Preservation	35.60	103.30	309.90	3.10	1.03	1.03	1.03
	Agriculture	15.40	45.01	20256.39	38.71	0.45	0.45	0.45
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	7.00	20.27	8534.09	36.49	3.73	1.62	22.10
	Low Density Residential	5.00	12.61	2584.03	2.42	1.61	0.71	1.01
	Medium Density Residential	33.00	96.24	39457.99	36.19	24.64	10.78	15.40
	High Density Residential	3.00	7.82	4488.11	4.07	2.81	1.25	1.75
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	4.13	1189.44	4.63	2.31	0.62	2.31
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	1.00	2.92	1578.42	1.29	1.23	0.00	5.85
	<i>Subtotal</i>	100.00	292.30	78398.36	126.88	37.82	16.46	49.90

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Poplar Creek 6D010 Area 159.4	Wetland, Forest, Preservation	50.00	79.59	238.77	2.39	0.80	0.80	0.80
	Agriculture	5.00	7.95	3577.50	6.84	0.08	0.08	0.08
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	1.00	1.57	662.65	2.83	0.29	0.13	1.72
	Low Density Residential	40.00	63.58	13033.90	12.21	8.14	3.56	5.09
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4.00	6.38	6733.06	6.82	17.22	2.55	13.39
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.33	95.04	0.37	0.18	0.05	0.18
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	159.40	24340.92	31.46	26.70	7.16	21.25
Poplar Creek 6D020 Area 91.1	Wetland, Forest, Preservation	35.00	30.94	92.81	0.93	0.31	0.31	0.31
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	2.00	1.73	729.17	3.12	0.32	0.14	1.89
	Low Density Residential	60.00	54.05	11080.25	10.38	6.92	3.03	4.32
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	3.00	2.64	2791.01	2.83	7.14	1.06	5.55
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	1.74	501.12	1.95	0.97	0.26	0.97
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	91.10	15194.36	19.20	15.66	4.79	13.05
Poplar Creek 6E010 Area 34.2	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	4.00	1.37	615.60	1.18	0.01	0.01	0.01
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	1.00	0.34	147.06	0.05	0.41	0.09	1.25
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	93.00	31.81	5884.11	4.13	1.27	1.27	1.27
	Extractive, Landfill	2.00	0.68	2287.30	0.06	0.01	0.01	0.01
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	34.20	8934.07	5.42	1.70	1.38	2.54
Poplar Creek 6F010 Area 38.4	Wetland, Forest, Preservation	43.00	16.51	49.54	0.50	0.17	0.17	0.17
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	37.00	14.21	2912.64	2.73	1.82	0.80	1.14
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	20.00	7.68	1420.80	1.00	0.31	0.31	0.31
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	100.00	38.40	4382.98	4.22	2.29	1.27	1.61

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas	Land Uses	Total Loadings						
		Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
		(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Mill Creek 7A010	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 11.4	Park	70.00	7.98	3327.66	22.42	0.08	0.08	0.48
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	30.00	3.27	670.35	0.63	0.42	0.18	0.26
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.15	43.20	0.17	0.08	0.02	0.08
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	11.40	4041.21	23.22	0.58	0.29	0.82
Mill Creek 7B010	Wetland, Forest, Preservation	12.00	29.72	89.17	0.89	0.30	0.30	0.30
	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area 247.7	Park	63.00	156.05	65073.27	438.50	1.56	1.56	9.36
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	25.00	61.93	12694.63	11.89	7.93	3.47	4.95
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	247.70	77857.06	451.28	9.78	5.33	14.61
Mill Creek 7B020	Wetland, Forest, Preservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Agriculture	8.00	12.30	5533.20	10.57	0.12	0.12	0.12
Area 153.7	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Low Density Residential	85.00	129.94	26636.68	24.95	16.63	7.28	10.39
	Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	0.75	216.00	0.84	0.42	0.11	0.42
	Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Extractive, Landfill	7.00	10.72	35844.34	0.96	0.11	0.11	0.11
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	153.70	68230.21	37.33	17.28	7.62	11.04
Mill Creek 7B030	Wetland, Forest, Preservation	25.00	278.30	834.89	8.35	2.78	2.78	2.78
	Agriculture	39.00	434.51	195528.15	373.68	4.35	4.35	4.35
Area 1117.3	Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Institutional	1.00	11.02	4640.68	19.84	2.03	0.88	12.02
	Low Density Residential	30.00	329.80	67609.00	63.32	42.21	18.47	26.38
	Medium Density Residential	1.00	11.02	4519.43	4.14	2.82	1.23	1.76
	High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	1.00	11.17	11798.69	11.96	30.17	4.47	23.46
	Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Arterial	0.00	8.55	2462.40	9.58	4.79	1.28	4.79
	Open Water	2.00	22.35	4134.01	2.90	0.89	0.89	0.89
	Extractive, Landfill	1.00	10.58	35389.55	0.95	0.11	0.11	0.11
	Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<i>Subtotal</i>	100.00	1117.30	326916.80	494.72	90.15	34.46	76.54

Table ____
City of New Berlin - Stormwater Management Study
Calculation of Total Loadings - Future Conditions

Drainage Areas		Land Uses		Total Loadings						
				Area	Area	Sediment	Phosphorous	Lead	Copper	Zinc
				(%total)	(acres)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)	(lb./yr.)
Mill Creek	7B040	Wetland, Forest, Preservation	14.00	28.83	86.48	0.86	0.29	0.29	0.29	
Area	205.9	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Low Density Residential	85.00	174.58	35787.88	33.52	22.35	9.78	13.97	
		Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Arterial	0.00	0.44	126.72	0.49	0.25	0.07	0.25	
		Open Water	1.00	2.06	380.92	0.27	0.08	0.08	0.08	
		Extractive, Landfill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Subtotal	100.00	205.90	36381.99	35.14	22.96	10.21	14.58	
		Mill Creek	7C010	Wetland, Forest, Preservation	17.00	47.30	141.89	1.42	0.47	0.47
Area	281.8	Agriculture	15.00	42.27	19021.50	36.35	0.42	0.42	0.42	
		Park	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Low Density Residential	58.00	162.27	33266.17	31.16	20.77	9.09	12.98	
		Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Highway	9.00	25.36	25438.09	55.80	145.32	15.72	65.94	
		Arterial	0.00	2.07	596.16	2.32	1.16	0.31	1.16	
		Open Water	1.00	2.82	521.33	0.37	0.11	0.11	0.11	
		Extractive, Landfill	0.00	-0.29	-969.76	-0.03	0.00	0.00	0.00	
		Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Subtotal	100.00	281.80	78015.37	127.38	168.26	26.13	81.09	
		Mill Creek	7D010	Wetland, Forest, Preservation	3.00	11.19	33.56	0.34	0.11	0.11
Area	372.9	Agriculture	27.00	100.68	45307.35	86.59	1.01	1.01	1.01	
		Park	15.00	55.94	23324.90	157.18	0.56	0.56	3.36	
		Institutional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Low Density Residential	20.00	73.51	15069.55	14.11	9.41	4.12	5.88	
		Medium Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		High Density Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Highway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Arterial	0.00	3.34	961.92	3.74	1.87	0.50	1.87	
		Open Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Extractive, Landfill	35.00	128.25	428851.28	11.54	1.28	1.28	1.28	
		Railroad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Subtotal	100.00	372.90	513548.56	273.50	14.24	7.58	13.51	

APPENDIX E

Suggested Best Management Practices for Selected Industries

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: MANUFACTURERS OF ELECTRONIC AND ELECTRICAL EQUIPMENT AND COMPONENTS, PHOTOGRAPHIC AND OPTICAL GOODS

Activity	Best Management Practices
Outdoor Unloading and Loading	-Confine loading/unloading activities to a designated area. -Consider performing loading/unloading activities indoors or in a covered area. -Consider covering loading/unloading area with permanent cover (e.g., roofs) or temporary cover (e.g., tarps). -Close storm drains during loading/unloading activities in surrounding areas. -Avoid loading/unloading materials in rain. -Inspect the loading/unloading areas to detect problems before they occur. -Inspect all containers prior to loading/unloading of any raw or spent materials. -Consider berming, curbing, or diking loading/unloading areas. -Dead-end sump where spilled materials could be directed. -Drip pans under hoses. -Use dry clean-up methods instead of washing the areas down. -Train employees on proper loading/unloading techniques and spill prevention and response.
Outdoor Material Storage (including waste, and particulate emission management)	-Confine storage of materials, parts, and equipment to designated areas. -Consider secondary containment using curbing, berming, or diking all liquid storage areas. -Train employees in spill prevention and response techniques. -Train employees on proper waste control and disposal. -Consider covering tanks. -Ensure that all containers are closed (e.g., valves shut, lids sealed, caps closed). -Wash and rinse containers indoors before storing them outdoors. -If outside or in covered areas, minimize runoff of storm water by grading the land to divert flow away from containers. -Leak detection and container integrity testing. -Direct runoff to onsite retention pond. -Inventory all raw and spent materials. -Clean around vents and stacks. -Place tubs around vents and stacks to collect particulate. -Inspect air emission control systems (e.g., baghouses) regularly, and repair or replace if necessary. -Store wastes in covered, leak proof containers (e.g., dumpsters, drums). -Consider shipping all wastes to offsite landfills or treatment facilities. -Ensure hazardous waste disposal practices are performed in accordance with Federal, State, and local requirements.

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities, Notice. Federal Register, September 29, 1995.

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: ACTIVITIES AT VEHICLE AND EQUIPMENT MAINTENANCE SHOPS

Activity	BMPs
Fueling	-Use spill and overflow protection. -Minimize runoff of storm water into the fueling area by grading the area such that storm water only runs off. -Reduce exposure of the fuel area to storm water by covering the area. -Use dry cleanup methods for fuel area rather than hosing the fuel area down. -Use proper petroleum spill control. -Perform preventive maintenance on storage tanks to detect potential leaks before they occur. -Inspect the fueling area to detect problems before they occur. -Train employees on proper fueling techniques.
Vehicle and equipment maintenance	-Maintain an organized inventory of materials used in the maintenance shop. -Dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers properly. -Label and track the recycling of waste material (e.g., used oil, spent solvents, batteries). -Drain oil filters before disposal or recycling. -Drain and contain all fluids from wrecked vehicles and “parts” cars. -Store cracked batteries in a nonleaking secondary container. -Promptly transfer used fluids to the proper container; do not leave full drip pans or other open containers around the shop. Empty and clean drip pans and containers. -Do not pour liquid waste down floor drains, sinks, or outdoor storm drain inlets. -Plug floor drains that are connected to the storm or sanitary sewer; if necessary, install a sump that is pumped regularly. -Inspect the maintenance area regularly for proper implementation of control measures. -Train employees on proper waste control and disposal procedures.
Outdoor vehicle and equipment storage and parking	-Use drip pans under all vehicles and equipment waiting for maintenance. -Cover the storage area with a roof. -Inspect the storage yard for filling drip pans and other problems regularly. -Train employees on procedures for storage and inspection items.
Painting areas	-Keep paint and paint thinner away from traffic areas to avoid spills. -Spray paint in an Occupational Safety and Health Act (OSHA) approved hood. -Use effective spray equipment that delivers more paint to the target and less over-spray. -Avoid sanding in windy weather and collect and dispose of waste properly. -Recycle paint, paint thinner, and solvents. -Inspect painting procedures to ensure that they are conducted properly. -Recycle paint, paint thinner, and solvents. -Inspect painting procedures to ensure that they are conducted properly. -Train employees on proper sanding, painting, and spraying techniques.
Vehicle or equipment washing	-Avoid washing parts or equipment outside.

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: ACTIVITIES AT VEHICLE AND EQUIPMENT MAINTENANCE SHOPS

Activity	BMPs
areas	-Use phosphate-free biodegradable detergents. -Designate an area for cleaning activities. -Contain and recycle washwaters. -Ensure that washwaters drain well. -Inspect cleaning area regularly. -Train employees on proper washing procedures.
Liquid storage in above ground storage	-Maintain good integrity of all storage containers. -Install safeguards (such as diking or berming) against accidental releases at the storage area. -Inspect storage tanks to detect potential leaks and perform preventive maintenance. -Inspect piping systems (pipes, pumps, flanges, couplings, hoses, and valves) for failures or leaks. -Train employees on proper filling and transfer procedures.
Cold weather activities	-Minimize salt application. -Use uncontaminated dirt or ash, if use is necessary. -Train employees on proper salt, dirt, sand, or ash application.
Improper connections to storm sewer	-Plug all floor drains connected to sanitary or storm sewer or if connection is unknown. Alternatively, install a sump that is pumped regularly -Perform smoke or dye testing to determine if interconnections exist between sanitary water system and storm sewer system. -Update facility schematics to accurately reflect all plumbing connections. -Install a safeguard against vehicle washwaters entering the storm sewer unless permitted. -Maintain and inspect the integrity of all underground storage tanks; replace when necessary. -Train employees on proper disposal practices for all materials.

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities, Notice. Federal Register, September 29, 1995.

SUGGESTED STORM WATER BEST MANGEMENT PRACTICES FOR FACILITIES WHICH: MANUFACTURE TRANSPORTATION EQUIPMENT, INDUSTRIAL, OR COMMERCIAL MACHINERY

Activity	Best Management Practices
Outdoor Unloading and Loading	-Confine loading/unloading activities to a designated area. -Consider performing loading/unloading activities indoors or in a covered area. -Consider covering loading/unloading area with permanent cover (e.g., roofs) or temporary cover (e.g., tarps) -Close storm drains during loading/unloading activities in surrounding areas. -Avoid loading/unloading materials in the rain. -Inspect the unloading/loading areas to detect problems before they occur. -Inspect all containers prior to loading/unloading of any raw or spent materials. -Consider berming, curbing, or diking loading/unloading areas. -Use dry clean-up methods instead of washing the areas down. -Train employees on proper loading/unloading techniques.
Outdoor Material Storage (including waste, and particulate emission management)	-Confine storage materials, parts, and equipment to designated areas. -Consider curbing, berming, or diking all liquid storage areas. -Train employees on proper waste control and disposal. -Consider covering tanks. -Ensure that all containers are closed (e.g., valves shut, lids sealed, caps closed). -Wash and rinse containers indoors before storing them outdoors. -If outside or in covered areas, minimize runoff of storm water by grading the land to divert flow away from containers. -Inventory all raw and spent materials. -Clean around vents and stacks. -Place tubs around vents and stacks to collect particulate. -Inspect air emission control systems (e.g., baghouses) regularly, and repair or replace when necessary. -Store wastes in covered, leak proof containers (e.g., baghouses, drums). -Consider shipping all wastes to offsite landfills or treatment facilities. -Ensure hazardous waste disposal practices are performed in accordance with Federal, State, and local requirements.

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities, Notice. Federal Register, September 29, 1995.

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: MINERAL MINING AND PROCESSING FACILITIES

Activity	Best Management Practices
Fueling	-Use spill and overflow protection. -Minimize runoff of storm water into the fueling area by grading the area such that storm water only runs off. -Reduce exposure of the fuel area to storm water by covering the area. -Use dry cleanup methods for fuel area rather than hosing the fuel area down. -Use proper petroleum spill control. -Perform preventive maintenance on storage tanks to detect potential leaks before they occur. -Inspect the fueling area to detect problems before they occur. -Train employees on proper fueling techniques.
Vehicle and equipment maintenance	-Maintain an organized inventory of materials used in the maintenance shop. -Dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers properly. -Label and track the recycling of waste material (e.g., used oil, spent solvents, batteries). -Drain oil filters before disposal or recycling. -Drain and contain all fluids from wrecked vehicles and “parts” cars. -Store cracked batteries in a nonleaking secondary container. -Promptly transfer used fluids to the proper container; do not leave full drip pans or other open containers around the shop. Empty and clean drip pans and containers. -Do not pour liquid waste down floor drains, sinks, or outdoor storm drain inlets. -Plug floor drains that are connected to the storm or sanitary sewer; if necessary, install a sump that is pumped regularly. -Inspect the maintenance area regularly for proper implementation of control measures. -Train employees on proper waste control and disposal procedures.
Outdoor vehicle and equipment storage and parking	-Use drip pans under all vehicles and equipment waiting for maintenance. -Cover the storage area with a roof. -Inspect the storage yard for filling drip pans and other problems regularly. -Train employees on procedures for storage and inspection items.
Haul Road and Access Roads	-Placement of haul roads should occur as far as possible from natural drainage areas, lakes, ponds, wetlands, or floodplains. -Maintain as much vegetation as possible near haul roads. -The width and grade of haul or access roads should be minimal and should be designed to match natural contours of the areas. -Construction of haul roads should be supplemented by BMPs that divert runoff from the road surfaces, minimize erosion, and direct flow to the appropriate channels for discharge to treatment areas. - DISCHARGE DIVERSIONS: Dikes, curbs, and berms - CONVEYANCE SYSTEMS: Channels, gutters, culverts, rolling dips, road sloping, roadway water deflectors - RUNOFF DIVERSIONS: Check dams, rock outlet protection, level spreaders,

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: MINERAL MINING AND PROCESSING FACILITIES

Activity	Best Management Practices
	drop structures SEDIMENT CONTROL & COLLECTION: Gabions, riprap, native rock, retaining walls, straw bale barriers, sediment traps, catch basins, vegetated buffer strips, sediment settling ponds, siltation berms. VEGETATION: seeding, willow cutting establishment
Pits or Quarries	-Excavation of a pit or quarry must be accompanied by BMPs to minimize impacts to area surface waters. DISCHARGE DIVERSIONS: dikes, curbs, and berms CONVEYANCE SYSTEMS: channels, gutters RUNOFF DIVERSIONS: serrated slopes, benched slopes, contouring SEDIMENT CONTROL & COLLECTION: straw bale barriers, sediment settling ponds, siltation berms VEGETATION: seeding CONTAINMENT: plugging and grouting
Overburden waste rock and raw material piles	-Overburden, topsoil, and waste rock, as well as raw material and intermediate and final product stockpiles should be located away from surface waters and other sources of water. -If it is not possible to located materials away from surface waters, water should be diverted around the piles. -As many of the piles as possible should be revegetated, even if only on a temporary basis. -At closure, piles should be reclaimed. DISCHARGE DIVERSIONS: dikes, curbs, and berms CONVEYANCE SYSTEMS: channels, gutters RUNOFF DIVERSIONS: SERRATED slopes, benched slopes, contouring SEDIMENT CONTROL & COLLECTION: plastic matting, plastic netting, erosion control blankets, mulch-straw compaction, sediment/settling ponds, silt fences, siltation berms VEGETATION: top soiling, seedbed preparation, seeding CONTAINMENT: capping CONTAINMENT: plugging and grouting
Reclamation	-Reclaim in accordance with State and Federal standards -Restabilize any disturbed areas including haul or access roads, pits or quarries, sedimentation ponds, or work-out pits, and any overburden piles. DISCHARGE DIVERSIONS: dikes, curbs, and berms CONVEYANCE SYSTEMS: channels, gutters RUNOFF DIVERSIONS: check dams, rock outlet protection, level spreaders DIVERSIONS: SERRATED slopes, benched slopes, contouring, drain fields

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: MINERAL MINING AND PROCESSING FACILITIES

Activity	Best Management Practices
	SEDIMENT CONTROL & COLLECTION: gabions, riprap, native rock retaining walls, straw bale barriers, sediment traps, catch basins, vegetated buffer strips, sediment traps, siltation berms, catch basins, siltation berms, brush sediment barriers. VEGETATION: top soiling, seedbed preparation, seeding, willow cutting establishment.

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities, Notice. Federal Register, September 29, 1995.

SUGGESTED STORM WATER BEST MANAGEMENT PRACTICES FOR: PRINTING AND PUBLISHING FACILITIES

Activity	Best Management Practices
Plate Preparation	-Use aqueous-developed lithographic plates or wipe-on plates.
Printing	-Use press wipes as long as possible before discarding or laundering; dirty ones for the first pass, clean ones for the second pass. -Squeeze or centrifuge solvent out of dirty rags. -Set up an in-house dirty rag cleaning operation if warranted or send to approved industrial laundries, if available. -Dedicated press for inks with hazardous pigments/solvents. -Segregate used oil from solvents or other materials. -Use water-based inks in gravure and flexographic printing process.
Clean up	-Label sinks as to proper disposal of liquids. -Keep equipment in good condition. -Use doctor blades and squeegees to remove as much ink as possible prior to cleaning with solvent and rags. -Control solvent use during equipment cleaning, use only what you need. -Designate special areas for draining or replacing fluids. -Substitute nontoxic or less toxic cleaning solvents. -Recover waste solvents onsite with batch distillation if warranted or utilize professional solvent recycling. -Centralize liquid solvent cleaning in one location. -Have refresher courses in operating and safety procedures.
Stencil Preparation for Screen Printing	-Recapture excess ink from silkscreen process before washing the screen to decrease amount of ink used and cleaning emulsion used.
Material Handling and Storage Areas	-Store containerized materials (fuel, paints, inks, solvents, etc.) in a protected, secure location and away from drains. -Store reactive, ignitable, or flammable liquids in compliance with the local fire code. -Identify potentially hazardous materials, their characteristics, and use. -Eliminate/reduce exposure to storm water. -Control excessive purchasing, storage, and handling of potentially hazardous materials. -Keep records to identify quantity, receipt date, service life, users, and disposal routes secure and carefully monitor hazardous materials to prevent theft, vandalism, and misuse of materials. -Educate personnel for proper storage, use, cleanup, and disposal of materials. -Maintain good integrity of all storage tanks. -Inspect storage tanks to detect potential leaks and perform preventive maintenance. -Provide sufficient containment for outdoor storage areas for the larger of either 10 percent of the volume of all containers or 110 percent of the volume of the largest tank. -Use temporary containment where required by portable drip pans. -Use spill throughs for drums with taps. -Train employees on proper filling and transfer procedures. -Inspect piping systems (pipes, pumps, flanges, couplings, hoses, valves) for failures or leaks. -Handle solvents in designated areas away from drains, ditches, and surface waters. Locate designated areas preferably indoors or under a shed. -If spills occur: • Stop the source immediately • Contain the liquid until cleanup is complete • Deploy oil containment booms if the spill may reach the water. • Cover the spill with absorbent material. • Keep the area ventilated. • Dispose of cleanup material properly • Do not use emulsifier or dispersant.

Source: USEPA Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities, Notice. Federal Register, September 29, 1995.

APPENDIX F

Model Draft Shoreland Management Ordinance

Model Ordinance

Agricultural Shoreland Management Ordinance

Section 1: Introduction

1.01 Authority

This ordinance is adopted under the authority granted by section 92.17, Wisconsin Statutes.

1.02 Findings and Declaration of Policy

The Ozaukee County Land Conservation Department finds that agricultural and other activities conducted in close proximity to surface water can pollute Ozaukee County's water resources, and may result in actual or potential harm to the health of residents and transients; to livestock, aquatic life and other animals and plants; and to the property tax base of Ozaukee County.

1.03 Purpose

The purpose of this ordinance is to regulate agricultural activities within the agricultural shoreland management area in order to prevent surface water pollution and thereby protect the health of Ozaukee County residents and transients; prevent the spread of disease; and promote the prosperity and general welfare of the citizens of Ozaukee County.

1.04 Applicability

This ordinance applies to all lands and surface water in Ozaukee County that are in the agricultural shoreland management area, as defined in section 2. Ozaukee County shall use United States Geological Survey (USGS) quadrangle maps, with a scale of 1:24,000, to identify rivers, perennial streams, intermittent streams, lakes and ponds included under the jurisdiction of this ordinance.

1.05 Interpretation

In their interpretation and application, the provisions of this ordinance shall be held to be minimum requirements and shall be liberally construed in favor of Ozaukee County, and shall not be deemed a limitation or repeal of any other power granted by the Wisconsin Statutes.

1.06 Severability

If any section, provision, or portion of this ordinance is ruled invalid by a court, the remainder of the ordinance shall not for that reason be rendered ineffective.

1.07 Effective Date

This ordinance shall become effective upon adoption and publication by the Ozaukee County Board of Supervisors and upon approval by the Department of Agriculture, Trade and Consumer Protection.

1.08 Conflicts with Other Ordinances and Laws

Any conflict or inconsistency between this ordinance and Ozaukee County's Shoreland Zoning Ordinance will be governed by the more restrictive provision. In those areas of Ozaukee County within a drainage district regulated under Ch.88 of the Wisconsin Statutes, this ordinance shall apply to the extent not inconsistent with the powers, duties, and responsibilities of the Ozaukee County Drainage Board.

Section 2: Definitions

- 1) Agricultural lands means lands in agricultural use. Agricultural use has the meaning provided under s. 91.01 (1), Wisconsin Statutes.
- 2) Agricultural shoreland corridor means the land extending 20 feet from; the top of the bank on each side of a perennial stream or river, the centerline of an intermittent stream, or the ordinary high water mark of any lake or pond shown on a United States Geological Survey quadrangle map with a scale of 1:24,000.
- 3) Agricultural shoreland management area means all land that is within 300 feet of the following features as designated on United States Geological Survey quadrangle maps with a 1:24,000 scale:
 - a. The top of the bank of perennial streams or rivers,
 - b. The ordinary high water mark for ponds and lakes that are designated by name,
 - c. The ordinary high water mark for ponds that are not designated by name on the USGS quadrangle map.
- 4) Barnyard means a feedlot, dry lot or any area, other than a pasture, where animals have been, are or will be fed, confined, maintained or stabled for a total of 45 days or more in any 12 month period.
- 5) Best management practice means a practice included in the technical guide or an alternative best management practice that the Department of Agriculture, Trade and Consumer Protection determines to be the most effective, practicable means of preventing or reducing soil erosion or pollution from agricultural nonpoint sources to a level compatible with soil and water resource objectives.
- 6) Intermittent stream means a channel in which water does not flow continuously and that is identified as an intermittent stream on the United States Geological Survey quadrangle map with

a scale of 1:24,000.

7) Notice of availability of funds means a first class letter, return receipt requested, mailed by the Ozaukee County Land Conservation Department to the owner of the lands not meeting the ordinance standards, informing them of the availability of cost share funds under s. 92.14, Wisconsin Statutes.

8) Notice of problem means a first class letter, return receipt requested, mailed by the Ozaukee County Land Conservation Department to the owner of the lands not meeting the ordinance standards, informing the owner of the nature of the problem and the necessary process to correct it.

9) Ordinary high water mark means the point on the bank or shore up to which the presence and action of surface water is so continuous as to leave a distinctive mark. This may be erosion, absence of land plants, predominance of aquatic plants, or other easily recognized characteristics.

10) Pasture means land with a permanent, uniform cover of grasses or legumes used as forage for livestock. Pastures do not include areas where supplemental forage feeding is provided on a regular basis.

11) Perennial stream means a channel where water flows continuously and that is identified as a perennial or permanent stream on the United States Geological Survey quadrangle map with a scale of 1:24,000.

12) Technical guide means the United States Department of Agriculture Natural Resources Conservation Service Field Office Technical Guide that is currently in effect.

13) Vegetative buffer means an area within the agricultural shoreland corridor that is maintained at a minimum level of 70 percent ground cover.

Section 3: Activities Subject to Regulation

3.01 General Requirement

Any person who conducts agricultural activities within the agricultural shoreland management area or who employs another person to do the same, on land subject to this ordinance, shall be subject to the provisions of this ordinance. All activities on land within agricultural shoreland management areas must be conducted in ways that prevent soil erosion and minimize the movement of suspended solids into surface water.

3.02 Compliance with Ordinance Requirements

Persons are in compliance with this ordinance if they install or follow best management practices on their land affected by the ordinance and meet the intent of the standards in section 4.

Section 4: Standards

4.01 Agricultural Activities in the Agricultural Shoreland Corridor

1) Vegetative buffer. Landowners or operators shall establish and maintain an adequate vegetative buffer or equally effective erosion control practice, in the agricultural shoreland corridor. When a vegetative buffer is chosen, it shall be established according to technical guide standard 393, Riparian Vegetative Buffer. If any activity disturbs a vegetative buffer in the agricultural shoreland corridor, the landowner must replant or restore the disturbed area to an effective vegetative buffer as soon as practicable. Row cropping and tillage practices are prohibited in the agricultural shoreland corridor, except that tillage practices are allowed to establish or re-establish a seedbed.

2) Barnyards. Livestock holding areas, other than pastures as defined in section 2, are prohibited within the agricultural shoreland corridor unless a barnyard runoff control system is installed that meets technical guide standard 312.

3) Cattle Access. If there is a pollution problem resulting from the grazing or pasturing of livestock, the landowner or operator will be required to erect a fence no closer than 16 feet to the edge of the navigable stream, or otherwise abate the pollution in such a manner as may be determined by the Land Conservation Department. If a fence has to be erected, provisions will be allowed for watering livestock and shall be of design deemed appropriate by the Land Conservation Department.

4.02 Agricultural Activities in the Agricultural Shoreland Management Area

1) Cropland areas with annually tilled crops. Erosion on cropland within the agricultural shoreland management area must not exceed the tolerable rate (T) for the predominant soil in the field.

2) Pastures. Pastures within the agricultural shoreland management area must comply with Technical Guide Standard 510 for pasture and hayland management. Rotational grazing must comply with the Technical Standard 528A, Managed Grazing.

3) Agricultural lands receiving manure and other nutrients. Agricultural lands within the agricultural shoreland management area must meet technical guide standard 590 if they receive manure and other nutrients through the application of commercial fertilizer, and other added nutrients. Sludge applications are not allowed in the agricultural shoreland management area.

Section 5: Administration

5.01 Delegation of authority

Ozaukee County hereby designates the Ozaukee County Land Conservation Department to administer and enforce the provisions of this ordinance.

5.02 Administrative duties

In the administration and enforcement of this ordinance, the Ozaukee County Land Conservation Department shall:

- 1) Inform all landowners or operators subject to this ordinance of the potential agencies, which may be available to provide technical or financial assistance.
- 2) Establish a procedure for landowners or operators to contact the Ozaukee County Land Conservation Department about conditions on their land that are not in compliance with the Ordinance and establish a procedure for landowners or operators to apply for funding.
- 3) Send notices of problems to landowners or operators that are not in compliance with the Ordinance.
- 4) Provide accomplishment reports to the State Department of Agriculture, Trade and consumer Protection on the activities related to this Ordinance and its effectiveness.
- 5) Investigate complaints relating to compliance with the Ordinance.
- 6) Perform other duties as specified in the Ordinance.

5.03 Inspection Authority

The Ozaukee County Land Conservation Department is authorized to enter upon any lands affected by this ordinance to inspect the land to determine compliance with this ordinance. If permission cannot be received from the landowner or operator, entry by the Ozaukee County Land Conservation Department shall be according to Sections 66.122 and 66.123, Wisconsin Statutes.

5.04 Enforcement Procedure

1. A notice of problem must be mailed to the landowner or operator stating that the standards of this ordinance have not been met. The Ozaukee County Land Conservation Department shall prepare a conservation plan with the landowner or operator including a schedule of implementation. The Ozaukee County Land Conservation Department must provide a notice of availability of funds to the landowner or operator when funds are available to implement or install the necessary practices. A minimum of one year must elapse after the landowner's plan and schedule has been developed before beginning any enforcement action. The one-year deadline for enforcement action may be extended upon agreement between the landowner and the Ozaukee County Land Conservation Department.
2. The Ozaukee County Land Conservation Department, administering the ordinance, must provide along with the notice of problem: a list of pertinent best management practices and associated average costs per unit as provided by the Ozaukee County Land Conservation

authorized to hear and decide appeals where it is alleged that there is error in any order, requirement, decision, or determination by the Ozaukee County Land Conservation Department in administering the ordinance.

8.02 Procedure

The rules, procedures, duties, and powers of the Land Conservation Committee and Chapter 68, Wisconsin Statutes, shall apply to this ordinance.

8.03 Who May Appeal

Appeals may be made by any person having a substantial interest, which is adversely affected by the order, decision, or determination made by the Ozaukee County Land Conservation Department.

APPENDIX G

Operations and Maintenance Activities

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

The project team has drafted an operations and maintenance (O&M) plan which will provide the City with a means of addressing both the short and long term maintenance needs of its open channels, culverts, and detention facilities. Specifically, the program will identify needed maintenance activities and procedures, establish a priority and schedule for maintaining individual system components, and define program management needs including costs, staffing, and equipment.

The prioritization of O&M activities for this project are divided into three levels of service based upon corrective, preventative, and aesthetic maintenance. A brief description of the O&M for each of these types of prioritizations are as follows:

Corrective Maintenance

Corrective Maintenance is performed on an emergency or as-needed basis when the integrity of a stormwater drainage system is compromised. The focus of this type of maintenance is to protect the public health by repairing damages which threaten existing infrastructure or damage species and habitat.

Preventative Maintenance

Preventative maintenance is performed on a routine basis in order to ensure the proper operation of the stormwater drainage system. The intent of this type of maintenance is to continually retain the flow carrying capability of the stormwater drainage system.

Aesthetic Maintenance

Aesthetic maintenance is performed on a routine basis to enhance the appearance and appeal of the stormwater drainage system. The goal of this type of maintenance is to provide the public with stormwater facilities and components that enhance the community atmosphere.

Further information concerning the prioritization of the O&M levels of service are found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-11;7-12; and 7-13. Additional information can be found in 7-20; and in the yellow manilla folder.

Monitoring and Training Program

The adoption of a monitoring program is vital for insuring that the existing stormwater drainage system operates efficiently. As part of the monitoring program, the project team has compiled a series of inspection forms which can be used to identify areas within the drainage system to be monitored during each site visit. The benefit of utilizing such forms allows the City to compile a historical record of the stormwater drainage system, ensure a consistent means of gathering needed information, provide verification that the inspection was done routinely and proficiently, and identify areas where maintenance activities are needed and establish a schedule for their completion.

The frequency for performing the inspections is dependant upon the local climate and rainfall conditions of the study area. The initial estimates concerning frequency range between 1-2 times per year, and after the occurrence of major storm events.

To reduce the potential for improper inspection and maintenance, a mandatory inspector training and certification program must be implemented along with the monitoring program. By initializing such programs, the City benefits in two ways. First, by sending inspectors through the program, they become aware of the components, functions, and safety issues concerning each type of stormwater drainage system. Second, by educating the inspectors about what to look for, they are able to identify potential problems before they escalate into more serious issues.

The suggested components of the inspector training program in addition to further information are laid out in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-16.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

OPEN CHANNELS

Corrective Maintenance

Removal of debris and sediment

If conditions arise in which heavy deposits of debris and sediment are discovered and cause impediments to the flow of water, steps should be taken to restore the original flow characteristics of the channel.

Structural and erosion repairs

Typical problems encountered pertaining to structural repair work include: erosion damage in and around drop and grade control structures; random bank failures and bottom degradation of soft-lined low flow channels; local undermining of hard-lined low flow channels; stormsewer and bridge repair; and channel bank destabilization due to loss of vegetation, and undermining of riprap and other erosion protectors by scouring and general degradation.

Elimination of mosquito breeding areas

Local mosquito control experts should be consulted in order to find solutions to eliminate breeding areas.

Preventative Maintenance

Inspections

The condition of the open channels should be inspected at least annually but suggested to be between 2 and 3 times per year and after significant storm events.

Grass mowing

Waterways should be mowed regularly to maintain a healthy stand of vegetation, control weeds, and stimulate other grasses which will improve the stand. One suggested schedule is to mow on a yearly basis after the first of August. Accomplishing this task during late summer allows for nesting fowl to have ample time to hatch their eggs. When mowing, the stand should be cut to a height between 4 to 8 inches in order to provide protection for wildlife during winter months. If using a sickle style mower, the clippings should also be raked and removed so that they do not harm the grass stand. Another suggested schedule is to mow between 3 and 6 times per year in order to control weeds and promote community responsibility.

Grass maintenance

A grass fertilization plan should be implemented in order to retain the effectiveness and health of the vegetated cover. A suggested program would call for a yearly rate of 30 pounds of nitrogen per acre and variable rates of potassium and phosphorous to be applied. These variable loadings are dependant upon surrounding land use and agricultural crops being planted.

Vegetation management

Vegetation management should be done to help alleviate debris and obstruction problems within and around the open channels and drainage ditches. This activity includes the trimming and thinning of trees that encroach upon the channel; the clearing of excessive weeds and reeds; the adoption of a herbicidal treatment program; replacement of dead or dying plant life; and the continued use of mechanical equipment such as drag lines, bulldozers, backhoes, and excavators.

Trash, debris removal and control

On a yearly basis, America outdoors, the USDA Forest Service, The Bureau of Land

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

Management, and an assortment of other agencies sponsor National River Cleanup Week. During this week, cleanup kits, support materials, safety guidelines, and trash bags are provided for local cleanups. Registration for the event is free of charge, and local community organizations are placed in charge of organizing and executing the local events. This activity can also be accounted for by incorporating it into the adopted mowing operations or by implementing trash racks and debris traps.

Aesthetic Maintenance

Graffiti removal

Removal of graffiti will improve the appearance of the stormwater facility as well as act as a tool to discourage further acts of vandalism.

Trail repair

On a yearly basis, repairs to trail sections should be performed to guarantee accessible maintenance and promote an increase in pedestrian usage. A suggested schedule for accomplishing this is to formulate a yearly repair schedule with repairs to be performed following the winter season.

Further information concerning these activities as well as frequency and the time of year in which they should be performed are found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-11 to 7-16; “Design and Construction of Urban Stormwater Management Systems” on page 535; and “The Design, Construction, and Maintenance of Grass Waterways in Wisconsin” on page 7 and 47-49.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

CULVERTS

Corrective Maintenance

Removal of debris and sediment

Debris and sediment should be cleaned from culvert inlets and outlets between 1 and 2 times per year. It is recommended that the cleaning be done twice, but if only one cleaning is possible, it should be done prior to the rainy season.

Structural repairs

Structural repairs to the culverts should be performed when needed. Typical problem areas which may require repair include: inlet and outlet structures; settlement and subsidence; corrosion, spalling, and cracking repair; leaking; pipe deformation; and trash rack blockage.

Erosion repair around culverts

Erosion repair should be performed to alleviate the scouring of the transition areas due to high water velocities. If evidence of this occurs, erosion control measures must be repaired or constructed (including riprap aprons, concrete headwalls and wingwalls, and energy dissipation structures).

Preventative Maintenance

Inspections

Inspections of culverts should be performed in accordance with open channel maintenance operations. They should also be inspected after major storm events to determine if excessive sedimentation or blockage has occurred.

Trash, debris removal and control

Where applicable, trash racks should be used and regularly cleaned to prevent blockages and clogging. If trash and debris is evident within the structure, it should be removed when it begins to impede flow.

Aesthetic Maintenance

Graffiti removal

Removal of graffiti will improve the appearance of the stormwater facility as well as act as a tool to discourage further acts of vandalism.

Grass trimming

Trimming of grass around the inlet and outlet structures should be done to provide the public with a more attractive stormwater facility.

Further information concerning these activities as well as frequency and the time of year in which they should be performed are found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-11 to 7-16; “The Design and Construction of Urban Stormwater Management Systems” on pages 536-537; and the article entitled “City Fast-Tracks Culvert Replacement” on page 32.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

DETENTION FACILITIES (WET PONDS)

Corrective Maintenance

Removal of debris and sediment

Accumulated sediment can reduce both the appearance and pollutant removal efficiency of the pond. Every year it has been estimated that around 1% of the storage capacity is lost annually. A ten to twenty year clean-out cycle is recommended.

Structural repairs

In the event of a structural failure, equipment, staffing, and materials should be readily available on short notice. The repairs should only be performed by qualified personnel.

Erosion, dam, embankment, and slope repairs

Typical problems include settlement, scouring, cracking, sloughing, seepage, and rutting. Repairs need to be made quickly to ensure that the problems do not escalate into larger problems.

Elimination of mosquito breeding areas

Local mosquito control experts should be consulted in order to find solutions to eliminate breeding areas.

Snow and ice removal

This activity should be accomplished to protect inlets, outlets, and overflow emergency spillways from damage.

Preventative Maintenance

Inspections

Inspections should be performed annually during wet weather events whenever possible. Inspectors should check embankments for subsidence, erosion, cracking, and tree growth; the condition of the emergency spillway and drain; the accumulation of sediment; clogging of the barrel and outlet; the adequacy of upstream and downstream channel erosion protection measures; any modifications which have occurred to the contributing watershed and the pond structure; and the stability of the side-slopes.

Grass mowing

Grass mowing of side-slopes, embankment, and emergency spillway should be performed when grass exceeds 18" in height, and should be mowed to 2" in height. This approximately amounts to between 2-14 mowings per year to prevent woody growth, control weeds, prevent allergies, and retain neighborhood appearance (applicable to residential areas). Contacting local soil conservation districts may also provide maintenance requirements for various types of vegetation. According to a draft memorandum for the Charlotte-Mecklenburg Stormwater Services, dam embankments should be mowed monthly, while leaving the shoreline alone.

Grass maintenance

Activities needed in the maintenance of grassy areas include fertilization, dethatching, soil conditioning, and in some instances reseeding.

Vegetation management

Vegetation management should be done to help alleviate debris and obstruction problems in and around the detention facility. This activity includes the trimming and thinning of trees that encroach upon the channel; fertilization; the clearing of excessive weeds and reeds; the adoption of a herbicidal treatment program; and pest control.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

Erosion control

The side-slopes, emergency spillway, and embankment should all be annually or periodically checked for signs of erosion. If found, regrading or revegetation should be implemented to alleviate the problems. Riprap connecting the pilot channel between the upper and lower stages should also be periodically checked for need of regrouting or repair.

Mechanical components

Any valves, pumps, sluice gates, locks, fence gates, and access hatches should be maintained in accordance with the manufacturers recommendations. During each inspection, these components should be operated to assure continual performance.

Trash and debris control and removal

Debris and litter removal should be done in accordance with mowing operations. Particular attention should be addressed to floatable debris around the riser and outlet. Special attention should also be paid to areas where debris exceeds 1 cubic foot per 1000 square feet (~amount to fill office trash can)

Aesthetic Maintenance

Grass trimming

Trimming of grass around outlet structures, fences, and public trails should be done to provide the public with a more attractive stormwater facility.

Graffiti removal

Removal of graffiti will improve the appearance of the stormwater facility as well as act as a tool to discourage further acts of vandalism.

Odor Control

Algae and insect control

The control of insects and algal blooms can be remediated through the use of chemical applications, or biological applications such as the use of flathead minnows and other fish.

Further information concerning these activities as well as frequency and the time of year in which they should be performed are found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-11 to 7-16; “Controlling Urban Runoff” chapters 3 and 4; and King County, Washington’s Surface Water Design Manual” chapter 1 and appendix.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

DETENTION FACILITIES (DRY PONDS)

Corrective Maintenance

Removal of debris and sediment

Accumulated sediment can reduce both the appearance and pollutant removal efficiency of the pond. Every year it has been estimated that around 1% of the storage capacity is lost annually. A five to ten year clean-out cycle is recommended. For dry detention ponds, frequent spot clean-outs may be needed to clean sediment from the detention control device.

Structural repairs

In the event of a structural failure, equipment, staffing, and materials should be readily available on short notice. The repairs should only be performed by qualified personnel.

Dam, embankment, and slope repairs

Typical problems include settlement, scouring, cracking, sloughing, seepage, and rutting. Repairs need to be made quickly to ensure that the problems do not grow.

Elimination of mosquito breeding areas

Local mosquito control experts should be consulted in order to find solutions to eliminate breeding areas.

Erosion Repair

The side-slopes, emergency spillway, and embankment should all be annually or periodically checked for signs of erosion. If found, regrading or revegetation should be implemented to alleviate the problems. Riprap connecting the pilot channel between the upper and lower stages should also be periodically checked for need of regrouting or repair.

Snow and ice removal

This activity should be accomplished to protect inlets, outlets, and overflow emergency spillways from damage.

Preventative Maintenance

Inspections

Inspections should be performed annually during wet weather events whenever possible. Inspectors should check the extended detention control device for evidence of clogging, or too rapid a release; the upper stage pilot channel and flow path for evidence of erosion; subsidence, erosion, cracking, and tree growth on the embankment; the condition of the emergency spillway; the accumulation of sediment around the riser; the adequacy of upstream and downstream channel control measures; erosion of the pond's bed and banks; and modifications to the pond or its contributing watershed that may influence pond performance.

Grass mowing

Grass mowing of side-slopes, embankment, and emergency spillway should be performed when grass exceeds 18" in height, and should be mowed to 2" in height. This approximately amounts to between 2-14 mowings per year to prevent woody growth, control weeds, prevent allergies, and retain neighborhood appearance (applicable to residential areas).

Grass maintenance

Activities needed in the maintenance of grassy areas include fertilization, dethatching, soil conditioning, and in some instances reseeding.

Vegetation management

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

Vegetation management should be done to help alleviate debris and obstruction problems in and around the detention facility. This activity includes the trimming and thinning of trees that encroach upon the channel; fertilization; the clearing of excessive weeds and reeds; the adoption of a herbicidal treatment program; and pest control.

Erosion control

The side-slopes, emergency spillway, and embankment should all be periodically checked for signs of erosion. If found, regrading or revegetation should be implemented to alleviate the problems. Riprap connecting the pilot channel between the upper and lower stages should also be periodically checked for need of regrouting or repair.

Trash and debris control and removal

Debris and litter removal should be done in accordance with mowing operations. Particular attention should be addressed to floatable debris around the riser and outlet. Special attention should also be paid to areas where debris exceeds 1 cubic foot per 1000 square feet (~amount to fill office trash can).

Aesthetic Maintenance

Grass trimming

Trimming of grass around outlet structures, fences, and public trails should be done to provide the public with a more attractive stormwater facility.

Graffiti removal

Removal of graffiti will improve the appearance of the stormwater facility as well as act as a tool to discourage further acts of vandalism.

Weed control

Odor Control

Algae and insect control

The control of insects and algal blooms can be remediated through the use of chemical applications, or biological applications such as the use of flathead minnows and other fish.

Further information concerning these activities as well as frequency and the time of year in which they should be performed are found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-11 to 7-16; “Controlling Urban Runoff” chapter 3.

City of New Berlin Stormwater Management Plan: Operations and Maintenance Guidelines for Open Channels, Culverts, and Detention Facilities

COSTS

Overall Maintenance Costs

For wet and dry detention ponds, the estimate of the annual maintenance costs (estimated at 3x the surface area of the pond) range between \$300-\$500 per maintained acre which includes the pond and surrounding buffer (1987 dollars). Several ways to reduce costs include the management of the buffer zone as a meadow rather than a lawn, provide (if possible) on-site disposal, and provide a maintained access way to the facility at a minimum width of 10 feet.

In 1986, a review of several wet pond dredging operations in Northern Virginia estimated a range in cost between \$6.25 to \$22.40 per cubic yard and an average dredging cost of \$14 per cubic yard. This cost is based upon factors including size, accessibility, proximity to disposal site, and the method used to remove and transport the sediment. Costs associated for smaller ponds (<100,000 cf) range between \$5 and \$10 per cubic yard. If hauling or landfilling is required the costs climb even higher by \$5 to \$10 per cubic yard and \$15 to \$20 per cubic yard respectively.

For dry detention ponds, the removal cost for cleaning will be lower than that of wet ponds. Actual costs for dry detention ponds range between \$5 and \$10 per cubic yard (1987 dollars). This is due to the elimination of dewatering, drag-line, and hydraulic dredging techniques needed for wet pond clean up. If hauling or landfilling is needed, the same unit costs apply as those found from wet detention ponds.

For grass waterways, tables 6 and 7 of the article entitled “The Design, Construction, and Maintenance of Grass Waterways in Wisconsin” provide unit costs (in 1990 dollars) and life spans for a range of activities including seeding, mulching, grade stabilization structures, fertilizers, seed inputs, and herbicides.

For open channels, the Lincoln Creek Phase I Plan has established raw costs associated with operations and maintenance. Labor rates were estimated at \$17 per hour; equipment costs at \$200 per day; overhead and administrative costs at 3x raw labor; streambank repair and erosion control at \$75 per linear foot; and plant replacement at \$15 per plant (in 1998 dollars).

For detention basins, the Lincoln Creek Phase I Plan has utilized the same unit costs as seen above for open channels with the addition of slope repair which was estimated at a lump sum of between \$1,000 and \$3,000 per year (in 1998 dollars).

Further information concerning cost estimates are found in “The Design, Construction, and Maintenance of Grass Waterways in Wisconsin” on pages 52-53; a memo concentrating on the operations and maintenance of the improved Lincoln Creek Phase I Project; and “Controlling Urban Runoff” chapters 3 and 4.

Staffing

For the monitoring and inspection program, the Lincoln Creek Phase I Plan called for a 2-person crew to inspect all open channels.

For mowing of native grass, the Lincoln Creek Phase I Plan called for a 1-person crew.

For vegetative management and weed control, the Lincoln Creek Phase I Plan called for a 2-person crew.

For graffiti removal, the Lincoln Creek Phase I Plan called for a 1-person crew.

For storm sewer and bridge repairs, the Lincoln Creek Phase I Plan called for a 3-person crew.

Equipment

Information concerning a broad listing of maintenance equipment and materials is found in “Operation, Maintenance, and Management of Stormwater Management Systems” on page 7-18; and “Turf and Roadside Maintenance” on pages B-96 to B-104.

Operation and Maintenance Report for Stormwater Open Channels

Inspector Name _____ Community _____

Inspection Date _____

Open Channel Reach location _____ Watershed _____

Length _____

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
I. Open Channels						
A. General channel conditions					A,S	
1 Streambank erosion and scouring						
a Upper bank (mass wasting or slumping)						
b Lower bank (root mat overhangs and sloughing)						
2 Sedimentation						
3 Evidence of obstructions, debris, and trash						
4 Future obstruction potential						
a Small size and volume						
b Medium size and volume						
c Heavy size and volume						
5 Condition of vegetation and ground cover along streambank						
6 Encroachment on open channel by trees and shrubs						
7 Other (specify)						
B. Structural conditions					A	
1 Condition of drop or grade control structure						
2 Stormsewer and bridge repair						
3 Undermining of hard-lined channel section						
4 Other (specify)						
C. Other					A	
1 Trail condition						
2 Aesthetics						
a Grass mowing required						
b Graffiti removal required						
c Other (specify)						
II. Summary						

1 Inspectors Remarks: _____

Open Channel Inspection Form

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		

2 Overall condition of open channel reach (check one) ☐ No action necessary. Continue routine inspections.

☐ Action required. Need to establish time frame for correction or repair.

3 Photographs taken on-site:

(photo number and brief description of problem)

4 Dates any maintenance must be completed by:

5 Re-inspection accomplished on

6 Corrections or repairs were completed

☐ Yes

☐ No

Operation and Maintenance Report for Stormwater Culverts

Inspector Name _____ Community _____
 Inspection Date _____ Address _____

 Culvert identification _____
 Type of material: _____ Reinforced concrete Watershed _____
 _____ Corrugated metal pipe
 _____ Other (specify) "As-Built" plans available Y / N

Inspection Frequency Key A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
I. Culvert Information						
A. Structural condition					A	
1 Evidence of settlement or subsidence						
2 Evidence of frost action						
3 Downstream invert condition						
4 Upstream invert condition						
5 Trash rack condition (if applicable)						
6 Other (specify)						
B. Non-structural condition					A,S	
1 Sedimentation present						
2 Erosion and scouring						
3 Evidence of obstructions						
4 Potential blockage debris found						
upstream of structure (specify)						
5 Presence of unmarked utility lines						
6 Other (specify)						
C. Concrete/masonry condition					A	
1 Cracking						
a Minor (< 6" in length)						
b Major (> 6" in length)						
2 Spalling						
3 Joint failures						
4 Water tightness / leaking						
5 Spring-line failure						
6 Other (specify)						
C. Corrugated metal pipe condition					A	
1 Corrosion						
2 Vertical deformation						
3 Other (specify)						

II. Summary

1 Inspectors Remarks: _____

Culvert Inspection Form

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		

2 Overall condition of culvert (check one) ☐ No action necessary. Continue routine inspections.

☐ Action required. Need to establish time frame for correction or repair.

3 Photographs taken on-site:

(photo number and brief description of problem)

4 Dates any maintenance must be completed by:

5 Re-inspection accomplished on

6 Corrections or repairs were completed ☐ Yes

☐ No

Operation and Maintenance Report for Stormwater Management Ponds

(Adapted from "Operation, Maintenance, and Management of Stormwater Management Systems" by Eric Livingston and Florida Department of Environmental Protection)

Inspector Name _____ Community _____
 Inspection Date _____ Address _____
 Stormwater Pond _____
 Wet _____
 Dry _____ Watershed _____

"As-Built" plans available Y / N

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
I. Pond Components						
A. Embankment and emergency spillway					A,S	
1 Vegetation and ground cover adequate						
2 Embankment erosion						
3 Animal burrows						
4 Unauthorized plantings						
5 Cracking, bulging, or sliding of dam						
a Upstream face						
b Downstream face						
c At or beyond toe						
Upstream						
Downstream						
d Emergency spillway						
6 Pond, toe, and chimney drains clear and functioning						
7 Seeps / leaks on downstream face						
8 Slope protection or riprap failures						
9 Vertical and horizontal alignment of top of dam as "As-Built" plans						
10 Emergency spillway clear of obstructions and debris						
11 Rock missing						
12 Other (specify)						
B. Riser and principle spillway					A	
Type: Reinforced concrete _____						
Corrugated pipe _____						
Masonry _____						
1 Low flow orifice obstructed						
2 Low flow trash rack						
a Debris removal necessary						
b Corrosion control						
3 Weir trash rack maintenance						
a Debris removal necessary						
b Corrosion control						
4 Excessive sediment accumulation inside riser						
5 Concrete/masonry condition						
riser and barrels						
a Cracks or displacement						
b minor spalling (<1")						

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
c major spalling (rebar exposed)						
d Joint failures						
e water tightness						
6 Metal pipe condition						
7 Control valve						
a Operational/exercised						
b Chained and locked						
8 Pond drain valve						
a Operational/exercised						
b Chained and locked						
9 Outfall channels functioning						
10 Other (specify)						
C. Permanent pond (wet ponds)					M	
1 Undesirable vegetative growth						
2 Floating or floatable debris removal required						
3 Visible pollution						
4 Shoreline problems						
5 Other (specify)						
D. Sediment forebays						
1 Sedimentation noted						
2 Sediment cleanest when depth < 50% design depth						
E. Dry pond areas					M	
1 Vegetation adequate						
2 Undesired vegetative growth						
3 Undesirable woody growth						
4 Low flow channels clear of obstructions						
5 Standing water or wet spots						
6 Sediment and/or trash accumulation						
7 Other (specify)						
F. Condition of outfalls into pond					A,S	
1 Riprap failures						
2 Slope erosion						
3 Storm drain pipes						
4 Endwalls/headwalls						
5 Other (specify)						
G. Other					M	
1 Encroachments on pond or easement area						
2 Complaints from residents (describe on back)						
3 Aesthetics						
a Grass mowing required						
b Graffiti removal needed						
c Other (specify)						
4 Any public health hazards (specify)						
5 Presence of poisonous vegetation						
6 Presence of excessive insect infestation						
7 Maintenance access						
H. Constructed wetland areas					A	
1 Vegetation healthy and growing						
2 Evidence of invasive species						

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
3 Excessive sedimentation in wetland area						

II. Summary

1 Inspectors Remarks: _____

2 Overall condition of facility (check one) ☐ No action necessary. Continue routine inspections.

☐ Action required. Need to establish time frame for correction or repair.

3 Photographs taken on-site: _____

(photo number and brief description of problem) _____

4 Dates any maintenance must be completed by: _____

5 Site re-inspection accomplished on _____

6 Facility corrections or repairs were completed ☐ Yes

☐ No

Operation and Maintenance Report for Stormwater Drainage Swales

Inspector Name _____ Community _____

Inspection Date _____ Watershed _____

Drainage swale Reach location _____

Length _____

Inspection Frequency Key A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
I. Drainage Swales						
A. General swale conditions					A,S	
1 Erosion and scouring						
a Bottom						
b Side						
2 Sedimentation						
a Even distribution						
b Uneven distribution						
3 Vegetation type						
a Grass _____						
b Wetland _____						
c Shrubs _____						
d Trees _____						
4 Vegetation abundance						
a None _____						
b Sparse _____						
c Moderate _____						
d Heavy _____						
5 Vegetation condition						
a Healthy _____						
b Dry / brown _____						
c Uprooted _____						
d Toppled _____						
6 Standing water evident						
7 Trash and debris evident						
8 Other (specify) _____						
II. Summary						

1 Description of swale _____

(shape, lining, depth, _____

and width) _____

2 Inspectors Remarks: _____

2 Overall condition of drainage swale reach (check one) ☐ No action necessary. Continue routine inspections.

___ Action required. Need to establish time frame for correction or repair.

3 Photographs taken on-site:

(photo number and brief description of problem)

4 Dates any maintenance must be completed by:

5 Re-inspection accomplished on

6 Corrections or repairs were completed

___ Yes

___ No

Operation and Maintenance Report for Stormwater Infiltration Facilities

(Adapted from "Operation, Maintenance, and Management of Stormwater Management Systems" by Eric Livingston and Florida Department of Environmental Protection)

Inspector Name _____ Community _____
 Inspection Date _____ Address _____
 Infiltration Facility _____
 Basin _____
 Trench _____ Watershed _____

"As-Built" plans available Y / N

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
I. Infiltration Basin						
A. Debris cleanest					M	
1 Basin bottom clear of debris						
2 Inlet clear of debris						
3 Outlet clear of debris						
4 Emergency spillway clear of debris						
B. Sediment traps or forebays					A	
1 Obviously trapping sediment						
2 Greater than 50% of storage volume remaining						
C. Vegetation					M	
1 Mowing done when needed						
2 Fertilized per specifications						
3 No evidence of erosion						
D. Dewatering					M	
1 Basin dewaterers between storms						
E. Sediment cleanout of basin					A	
1 No evidence of sedimentation in basin						
2 Sediment accumulation does not yet require cleanout						
F. Inlets					A	
1 Good condition						
2 No evidence of erosion						
G. Outlets/overflow spillway					A,S	
1 Good condition, no need for repair						
2 No evidence of erosion						
H. Structural repairs					A,S	
1 Embankment in good repair						
2 Side slopes are stable						
3 No evidence of erosion						
I. Fences/access repairs					A	
1 Fences in good condition						
2 No damage which would allow undesired entry						
3 Locks and gate function adequately						
II. Infiltration Trench						
A. Debris cleanout					M	
1 Basin bottom clear of debris						

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		
2 Inlet clear of debris						
3 Outlet clear of debris						
4 Emergency spillway clear of debris						
B. Sediment traps, forebays, or pretreatment swales					A	
1 Obviously trapping sediment						
2 Greater than 50% of storage volume remaining						
C. Vegetation					M	
1 Mowing done when needed						
2 Fertilized per specifications						
3 No evidence of erosion						
D. Dewatering					M	
1 Basin dewaterers between storms						
E. Sediment cleanout of basin					A	
1 No evidence of sedimentation in basin						
2 Sediment accumulation does not yet require cleanout						
F. Inlets					A	
1 Good condition						
2 No evidence of erosion						
G. Outlets/overflow spillway					A	
1 Good condition, no need for repair						
2 No evidence of erosion						
H. Aggregate repairs					A	
1 Surface of aggregate clean						
2 Top layer of stone does not need replacement						
3 Trench does not need rehabilitation						
I. Vegetated surface					M	
1 No evidence of erosion						
2 Perforated inlet functioning adequately						
3 Water does not stand on vegetated surface						
4 Good vegetative cover exists						

III. Summary

1 Inspectors Remarks: _____

Infiltration Facilities Inspection Form

Inspection Frequency Key

A= Annual M= Monthly S= After major storm event

Items Inspected	Checked		Maintenance Needed		Inspection Frequency	Remarks
	Yes	No	Yes	No		

2 Overall condition of facility (check one) ☐ No action necessary. Continue routine inspections.

☐ Action required. Need to establish time frame for correction or repair.

3 Photographs taken on-site:

(photo number and brief description of problem)

4 Dates any maintenance must be completed by:

5 Site re-inspection accomplished on

6 Facility corrections or repairs were completed ☐ Yes

☐ No

NEW BERLIN STREAM EVALUATION

Stream Name: _____ Date of Field Inventory: _____ Conducted By: _____

Reach Description: _____

Reach Length: _____

Location	Indicator Item Rated	Classification							
		Excellent		Good		Fair		Poor	
Upper Bank area between normal high water line and extreme high water line	Landform Slope steepness of land adjacent to the channel, related to extent and ease of erosion	Slope <30%	2	Slope 30 - 40 %	4	Slope 40-60%	6	Slope >60%	8
	Mass Wasting or Failure detachment of soil and movement downslope, potential for large volumes of material to be introduced into the stream	No evidence of occurrence	3	Infrequent or very small occurrences	6	Moderate frequency and size occurrences	9	Frequent or large occurrences	12
	Debris Jam Potential floatable objects such as branches or logs located along the bank, potential for the development of flow deflection and creation of debris jams	Essentially absent	2	Mostly small twigs and limbs	4	Present - quantity and size of material increasing	6	Moderate to heavy amounts - mostly large size materials	8
	Vegetative Bank Protection density of vegetation on the bank, related to stability of bank soils and reduction in erosion potential	Over 90% plant density	3	70-90% plant density	6	50-70% plant density	9	<50% Plant density	12
Lower Bank area between the waters edge during low flow period to the normal high water line	Channel Capacity ability of channel to transmit the volume of water	Ample for present flow and increases	1	Adequate - Overbank flow rare	2	Barely contains present peak flow	3	Inadequate - overbank flow common	4
	Bank Rock Content amount and size of rocks in the bank materials, related to the resistance to flow forces which may cause erosion	65% rock - large boulders >12" diameter	2	40-65% rock – mostly small boulders and cobbles 6-12" diameter	4	20-40% rock - 3-6" diameter	6	<20% rock - 1-3" diameter	8
	Obstructions objects within the stream channel, obstructions may change in flow direction and velocity	Rocks/old logs embedded - flow pattern without cutting or deposition	2	Some present - causing erosive cross currents and minor pool filling	4	Moderately frequent - causing bank cutting and filling of pools	6	Frequent obstructions - causing yearlong bank erosion and channel migration	8
	Cutting loss of vegetation protection on bank or increase in bank steepness	Little or none evident: raw banks infrequent and less than 6" high	4	Some present: raw banks up to 12" high	8	Significant: raw banks 12-24" high	12	Almost continuous cuts: some over 24" high	16
	Deposition deposition of sediment resulting in growth of sediment bars, indication of upstream erosion	Little or no evidence	4	Some new increases	8	Moderate deposition	12	Extensive deposition	16
		Column Total		Column Total		Column Total		Column Total	
		Excellent 23		Good 46		Fair 69		Poor	

DRAINAGE SWALE INVENTORY

City of New Berlin

Inspector: _____

Date: _____

Location

Designation: _____

Street Name: _____

Side: N S E W

From: _____ To: _____

Description:

Shape:		Lining:	none	concrete	asphalt	other: _____			
Depth:	1' - 2'	2' - 5'	5' - 10'	> 10'	Width:	0' - 5'	5' - 10'	10' - 20'	> 20'

Conditions Observed:

☐ Erosion

Bottom: <i>Slight</i>	Moderate	Severe
Side: <i>Slight</i>	Moderate	Severe



☐ Sedimentation

Material:	Silt	Sand	Gravel
Even Distribution:	<i>Slight</i>	Moderate	Severe
Uneven Distribution:	<i>Slight</i>	Moderate	Severe

☐ Vegetation

Abundance:	None	Sparse	Moderate	Heavy
Type:	Grass	Wetland Vegetation		Shrubs Trees
Condition:	<i>Healthy</i>	Dry/brown	Uprooted	Toppled

☐ Trash

Minor	Moderate	Heavy

☐ Standing Water

<3"	3" - 6"	6" - 12"	>12"

☐ Damaged Guard Rail

Missing	Deformed	Broken

☐ Sign Damage

Missing	Graffiti	Sign location: _____

APPENDIX H

Drainage Investigation Form

Drainage Investigation Form

TO BE FILLED OUT BY CLERICAL STAFF

Date called in: _____ Parcel No. _____

Drainage Investigation No. _____

Name: _____ Address: _____

Home Phone # _____ State, Zip _____

Work Phone # _____

Homeowner's description of problem: _____

Investigation taken by: _____

Investigation given to: _____

Are there any related investigations? ☐ Yes ☐ No

Related investigations attached? ☐ Yes ☐ No

TO BE FILLED OUT BY INSPECTION STAFF

Date of inspection: _____ Inspected by: _____

Property Owner(s) contacted: _____

DRAINAGE PROBLEM TYPE: (Check all that apply and fill in cause number code for each)

CAUSE NUMBER CODES:

☐ Home/Structure Flooding _____

1. Overbank Flooding

2. Sanitary Backup

☐ Basement Flooding _____

3. Groundwater

4. Blockage

☐ Yard Flooding _____

5. Drainage

6. New Development

☐ Stream Maintenance _____

7. Inadequate Drainage System

☐ Streambank Erosion _____

8. Pump Failure

9. Other _____

☐ Other _____

Inspector's description of problem: _____

How many other properties are affected by this problem: _____

Description of proposed solution: _____

RESPONSIBLE AGENCY(S):

☐ Environmental Concerns ☐ Other/Other City Department ☐ Joint ☐ Homeowner

Has this investigation been referred to another department? ☐ Yes ☐ No

If so, who(m): _____

If further action is required by Engineering or Public Works Departments, the following have been enclosed:

	Y	N	
☐ Pictures of complaint area	☐	☐	Is this a wetland?
	☐	☐	Is location in flood plain?
☐ Copy of plat/easement information	☐	☐	Hydric Soil? Soil Type _____
☐ Contour mapping for area			

☐ Alternative Analysis From to Engineer

TYPE OF RESPONSE: ☐ Written ☐ Verbal/Phone ☐ Forwarded to Staff