State of Wisconsin
Department of Natural Resources-WT/3
101 S. Webster St.
Madison, WI 53707

dnr.wi.gov

Final Report

Targeted Runoff Management Grant Program and Urban Nonpoint Source and Storm Water Management Grant Program

Notice: This final report is authorized by ss. 281.65 and 281.66, Wis. Stats., and chs. NR 153 and NR 155, Wis. Adm. Code. Personally identifiable information collected will be used for program administration and may be made available to requesters as required under Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.].

Instructions: Your grant agreement requires you to submit a Final Report 60 days after the end date listed in the grant agreement. This Final Report form must be used in conjunction with the "FINAL REPORT INSTRUCTIONS." The instructions detail how to complete and submit the report to DNR. The DNR prefers that Final Reports be submitted in electronic format. If, however, printed copies of Final Reports are submitted, please submit three (3) complete originals to your regional Nonpoint Coordinator.

1. Grant Type -- Please check one.

☐ Targeted Runoff Management Grant – Agricultural

☐ Targeted Runoff Management Grant – Urban

☐ Urban Nonpoint Source & Storm Water Management Grant – Construction

☒ Urban Nonpoint Source & Storm Water Management Grant -- Planning

2. Grantee & Project Information

Project Name	Grant Number
Indian Hills Stormwater Management Plan	**USP-FX03-64126-06**
Governmental Unit Name	Primary Watershed Name and Watershed Code
Village of Fontana	**Fox River**
Nearest Water Body Name	Nearest Water Body Identification Code (WBIC) (if applicable)
DNR Water Management Unit (River System) Name	s. 303 (d) Listed Waterbody? ☒ Yes ☐ No.
Mississippi River	

What pollutant(s) were addressed by the project (e.g., nitrogen, phosphorus, sediment, thermal control, *etc.*)?

Sediment, nutrients

For **each** project site location provide the following: (attach additional sheets if necessary)

Location:		A	B	C	D	E
Minor Civil Division Name (City, Township, Village, etc.)		**Village of Fontana**				
PLSS	Town	**1N**				
	Range	**16E**				
	Section	**13,14,23**				
	Quarter	**All**				
	Quarter-Quarter	**All**				
Latitude (degrees, minutes, seconds North of Equator; use the DNR's Surface Water Data Viewer, SWDV)		**N1300**				
Longitude (degrees, minutes, seconds W of Prime Meridian, use the SWDV)		**W5300**				
Property Owner(s)	Name	**Village of Fontana**				
	Mailing address	**PO Box 200** **Fontana, WI 53125**				

Site address *(Not mailing address)*	**Various**				

3. Summary of Results

A. Performance Standards and Prohibitions and Other Water Resources Management Priorities
For grants issued in calendar year 2006 or later, complete Tables A and B (following) consistent with the entries on your grant application.

TABLE A. PERFORMANCE STANDARDS AND PROHIBITIONS (per ch. NR 151, Wis. Adm. Code, effective October 1, 2002)

Performance Standard or Prohibition	Units of Measure	Quantity	Measurement Method Used
Sheet, rill and wind erosion	Acres meeting T		
Manure Storage Facilities: New Construction/Alterations	Number of facilities		
	Number of animal units		
Manure Storage Facilities: Closure	Number of facilities		
Manure Storage Facilities: Failing/Leaking Facilities	Number of facilities		
	Number of animal units		
Clean Water Diversions in WQMA	Pollutant load reduction		
	Number of farms with diversions		
	Number animal units		
Nutrient Management on Agricultural Land	Acres planned		
Prohibition: Manure Storage Overflow	Number of facilities		
	Number of animal units		
Prohibition: Unconfined Manure Pile in WQMA	Number of farms		
Prohibition: Direct Runoff From Feedlot/Stored Manure	Pollutant load reduction		
	Number of facilities		
	Number of animal units		
Prohibition: Unlimited Livestock Access	Feet of bank protected		
	Number of farms		
Urban: 20-40% Reduction in Total Suspended Solids (TSS)	Pounds TSS reduced		
	% TSS reduction		

TABLE B. OTHER WATER RESOURCES MANAGEMENT PRIORITIES

I. Agricultural Areas	Units of Measure	Quantity	Measurement Method Used
Buffers	Feet of bank protected		
	Number of farms		
Streambank	Tons of bank erosion reduced		
	Feet of bank protected		
Other (specify)			
II. Developed Urban Areas	**Units of Measure**	**Quantity**	**Measurement Method Used**
Urban: 20-40% Reduction in TSS	Pounds TSS reduced		
	% TSS reduction		
Infiltration	% Pre-development stay-on volume		
	Cubic feet stay-on volume		
Peak flow discharge	Change in cubic feet per second		
Protective areas	Feet of bank protected		
Fueling & maintenance areas	Oily sheen presence		
Streambank	Tons of bank erosion reduced		
	Feet of bank protected		
Other (specify)			
III. Planning	**Units of Measure**	**Quantity**	**Measurement Method Used**
Quantify how implementation of the planning project decreased storm water impacts on state waters (*i.e.*, storm water plan, I & E plan, *etc.*)	Municipalities planned for	**1**	
	Acres planned for	**230**	
Document/track progress made in implementing the planning product (*i.e.*, ordinance, utility district evaluation/formation, storm water management plan information & education, *etc.*)	Municipalities planned for		
	Acres planned for		

Other (specify)			

B. Project Results Narrative

To respond to an identified need for improved stormwater quality management, the Village of Fontana initiated the Indian Hills Stormwater Quality Management Plan project (the Project) with financial assistance and guidance from Wisconsin Department of Natural Resources (WDNR). The goal is to identify capital improvements and establish stormwater management practices to help control flooding and protect water quality in the Village of Fontana as the community continues to grow.

4. Satisfaction of Notice Requirements (if applicable)

If cost sharing for this project was offered under a formal notice to achieve compliance with performance standards or prohibitions, provide information for each notice in the table below.

Notice Information				Notice Satisfaction Information		
				Satisfied?		
Notice Type	Issue Date	From (Name)	To (Name)	Yes	No	Date Letter Sent
				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	

5. Summary of Project Challenges

Steep slopes, mowed turf and "semi-hard" surfaces throughout the Indian Hills Sub-division provide low filtration/infiltration potential for stormwater runoff from the impervious surfaces (rooftops, driveways, and other "hard" surfaces). The absence of a drainage system network (swales and ditches or storm sewers) forces the stormwater to flow overland, causing localized flooding problems. Unmanaged stormwater runoff may transport eroded soil and nutrients from the uplands, creating causing sedimentation and nutrient/chemical deposition in the lake. Vegetation on undeveloped lots serve as a natural buffer and enhance opportunities for stormwater filtration, infiltration, and velocity reduction; but new development and redevelopment could convert natural buffers into hard and semi-hard surfaces, increasing runoff rates, volumes, and erosion/sedimentation potential. State of Wisconsin laws encourage counties, Villages, and Towns to address non-point source pollution on a local level through the development and implementation of plans like this one.

6. Additional Information about the Project (optional)

7. Final Product(s) -- All Projects

A. Construction Projects

☐ A.1. Checking here indicates that a printed copy of project plans and specifications was sent to your DNR Regional Nonpoint Source Coordinator.

☐ A.2. Checking here indicates that photo-documentation of the project's construction is attached.

B. Planning Projects

☒ B.1. Checking here indicates that a printed copy of the planning product (*e.g.*, plans, ordinances, analyses) was sent to your DNR Regional Nonpoint Source Coordinator.

☐ B.2. Checking here indicates that the Regional Nonpoint Source Coordinator has approved the final Planning Product(s).

☐ B.3. Checking here indicates that your governmental unit has adopted the final Planning Product(s).

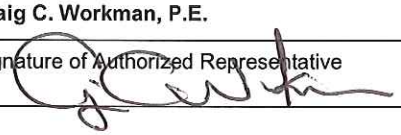
Name of Planning Document(s)	Date(s) effective	Date Submitted to NPS Coordinator

8. Grantee Certification:

☒ Checking here certifies that, to the best of your knowledge, the information contained in this report is correct and true.

Type or print Name and Title of Authorized Representative certifying here.

Craig C. Workman, P.E.

Signature of Authorized Representative  Date 5/28/2009

9. FOR DEPARTMENTAL USE ONLY

REGIONAL NONPOINT COORDINATOR -- Please complete the following:

☒ Checking here indicates that you received either planning or construction plans and specifications from the project sponsor, as appropriate. Attach a copy of the approval.

☐ Checking here indicates that you approved the final construction. Attach a copy of the final construction approval.

☒ Checking here indicates that you have approved the final Planning Product(s).

☐ Check here if two (2) signed, original copies of the Final Report and attachments have been sent to Runoff Management Section Grants Coordinator. Note: Regional Nonpoint Source Coordinator may retain one (1) copy of the signed, original Final Report.

Type or print Name of Regional Nonpoint Coordinator

Maureen McBroom

Signature of Regional Nonpoint Coordinator

Maureen McBroom

Date

8/13/09

FONTANA on Geneva Lake
Founded 1836

VILLAGE of FONTANA
on GENEVA LAKE
175 Valley View Dr. P.O. Box 200
Fontana, Wisconsin 53125

May 28, 2009

Mr. Gordon Stevenson, P.E.
Wisconsin DNR
PO Box 7921
Madison, WI 53707

Re: Indian Hills Stormwater Management Plan
UNPS Planning Grant Number USP-FX-64126-06
Village of Fontana

Dear Mr. Stevenson,

Please find the enclosed Final Report (DNR Form 3400-189) for the above mentioned project. I have also enclosed a copy of the Indian Hills Stormwater Management Plan, completed by Liesch Environmental last year. As I've discussed with Maureen McBroom, the Village is in the process of completing a "Village-Wide" Stormwater Management Plan with the consulting firm of Ruekert-Mielke. This plan will involve the re-evaluation of the Indian Hills watershed. In addition, the Village has contracted with Ruekert-Mielke to evaluate the feasibility of creating a stormwater utility for the Village. I will keep you posted on the progress of these two projects. In the meantime, if you have any questions or comments regarding the enclosed documents, or the projects that we are currently undertaking, do not hesitate to call me at (262) 275-3481.

Sincerely,
The Village of Fontana-On-Geneva Lake

Craig C. Workman, P.E.
Director of Public Works

encl.

cc: Maureen McBroom (w/ encl.)
Kelly Hayden, Village Administrator (w/o encl.)

VILLAGE OF FONTANA-ON-GENEVA LAKE
INDIAN HILLS STORMWATER QUALITY MANAGEMENT REPORT

Prepared for:

VILLAGE OF FONTANA-ON-GENEVA LAKE
WALWORTH COUNTY, WISCONSIN

Prepared by:

LIESCH ENVIRONMENTAL SERVICES, INC.
6000 GISHOLT DRIVE, SUITE 203
MADISON, WI 53713

FEBRUARY 2008
PROJECT NUMBER: 43022.00

THIS REPORT WAS PREPARED BY ME
OR UNDER MY DIRECT SUPERVISION

_____
HARRY L. SUMMITT, P.E.

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1.0 INTRODUCTION

1.1 OVERVIEW

Stormwater management is a critical issue for the Village of Fontana on Lake Geneva (Village of Fontana). It will become even more critical as the community continues to grow through infill development, redevelopment, and new development (**Figure 1**). An area of particular concern is the Indian Hills region, which due to steep slopes, impermeable surfaces and the absence of a storm sewer system, experiences localized flooding and water quality impacts to Lake Geneva. To respond to an identified need for improved stormwater quality management, the Village of Fontana initiated the Indian Hills Stormwater Quality Management Plan project (the Project) with financial assistance and guidance from Wisconsin Department of Natural Resources (WDNR). The goal is to identify capital improvements and establish stormwater management practices to help control flooding and protect water quality in the Village of Fontana as the community continues to grow.

1.1.1 COMMUNITY DESCRIPTION

The Village of Fontana was incorporated in 1924, encompassing approximately four square miles of land and surface water area with a 1.5 mile Extraterritorial Jurisdiction limit. The Town of Walworth borders the Village to the north, south and west, and the Town of Linn borders it to the east. State Highway 67 runs north south along the western side of the Village, while County Highway B runs in an east-west direction along the southern border of the community. The community consists of seasonal vacation cottages, former vacation cottages converted to homes, new homes, businesses, and undeveloped lots. The 2000 census data indicated that approximately 60 percent of the homes within the village are of a seasonal nature.

The project area is located in the Indian Hills sub-division, which is located on the east side of the Village of Fontana. The project area is approximately 230 acres in size consisting primarily of residential property.

1.1.2 PROBLEM STATEMENT

Steep slopes, mowed turf and "semi-hard" surfaces throughout the Indian Hills Sub-division provide low filtration/infiltration potential for stormwater runoff from the impervious surfaces (rooftops, driveways, and other "hard" surfaces). The absence of a drainage system network (swales and ditches or storm sewers) forces the stormwater to flow overland, causing localized flooding problems. Unmanaged stormwater runoff may transport eroded soil and nutrients from the uplands, creating causing sedimentation and nutrient/chemical deposition in the lake. Vegetation on undeveloped lots serve as a natural buffer and enhance opportunities for stormwater filtration, infiltration, and velocity reduction; but new development and

redevelopment could convert natural buffers into hard and semi-hard surfaces, increasing runoff rates, volumes and erosion/sedimentation potential. State of Wisconsin laws encourage counties, villages and towns to address non-point source pollution on a local level through the development and implementation of plans like this one.

1.1.3 DEVELOPMENT HISTORY

The first European settlers came to the Lake Geneva area around 1830. In 1858 a steamboat operated on the lake as a tourist attraction. Development accelerated in 1871 when a railway connected the area to Chicago. The Village of Fontana was incorporated in 1924 as a seasonal residential community. It had a population of 214 residents, no industries and limited commercial businesses. Since 1924 the Village has experienced stable population growth to the 1,754 permanent residents reported in the 2000 census, with 1,974 housing units, 764 of which are occupied year round.

1.2 PROJECT DEVELOPMENT

1.2.1 Project Objective

The Project provides a plan to protect the water quality of Lake Geneva and alleviate flooding by managing some of the uncontrolled stormwater flows through the Indian Hills sub-division.

The Village may augment current county ordinances and adopt community-specific ordinances to address stormwater management needs consistent with state regulations, specifically Chapters NR 151 and 152, Wisconsin Administrative Codes. The Village may also implement capital improvement projects to help control runoff rates and pollution potential.

2.0 RESOURCE INVENTORY

2.1 NATURAL ENVIRONMENT

2.1.1 WEATHER

The southeastern Wisconsin climate is generally continental, modified somewhat by Lake Michigan and Lake Superior. Winters are cold and snowy. Summers are warm. The growing season receives about two-thirds of the annual precipitation, normally adequate for vegetation although drought occurs occasionally in southeastern Wisconsin. Storms typically move from west to east or southwest to northeast in the direction of prevailing winds.

The average annual temperature as recorded by the cooperative weather station at Lake Geneva (474457) is 48.8 degrees Fahrenheit, with minimum and maximum average monthly temperatures of 20.1 and 74.4 degrees F. **Table 1** lists the mean, minimum, and maximum average monthly temperatures for this station.

Table 1. Monthly Temperatures at Lake Geneva

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	20.1	25.2	35.5	47.7	59.7	69.5	74.4	72.4	64.5	52.6	38.5	25.9
Min	12.2	16.9	26.2	36.7	47.6	57.4	63.1	61.7	53.7	42.6	30.8	18.8
Max	27.9	33.5	44.7	58.6	71.8	81.6	85.6	83.1	75.3	62.5	46.1	32.9

1971-2000 NCDC Normals

The average annual precipitation as indicated by the cooperative weather station at Lake Geneva (474457) is 37.05 inches of water. As part of total precipitation, 49.0 inches occurs as snow. **Table 2** lists the average monthly precipitation and snow depth for this station.

Table 2. Monthly Precipitation at Lake Geneva

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip.	2.04	1.64	2.67	3.83	3.53	4.04	3.85	4.07	3.51	2.69	2.81	2.37
Snow	14.4	9.4	7.0	2.4	0.1	0.0	0.0	0.0	0.0	0.1	3.7	11.9

1971-2000 NCDC Normal

Additional weather information includes wind speed and direction as it might apply to wave action along the southern shores of Lake Geneva. The nearest station that records this information is at Madison. **Table 3** summarizes the wind speed and direction data.

Table 3. Monthly Wind Speeds at Madison

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Speed	10.5	10.4	11.3	11.4	10.1	9.2	8.1	7.8	8.6	9.7	10.8	10.4
Prevailing	WNW 11.5	WNW 12.0	NW 13.0	S 11.4	S 10.4	S 9.7	S 9.2	S 9.1	S 9.8	S 10.4	S 10.7	WNW 11.0
Record Gust	NW 58	NW 62	S 67	SW 61	SW 64	W 83	N 83	N 64	NW 64	NW 62	W 55	NE 58

1948-1990 (average winds in miles per hour), 1971-1993 (gusts in miles per hour)

2.1.2 GEOLOGY AND SOILS

Bedrock units in southeastern Wisconsin dip toward the east, with bedrock overlain by glacial drift. The bedrock surface was shaped by pre-glacial and glacial erosion of exposed bedrock, with bedrock valleys shaped by the removal of the easily eroded Maquoketa shale layer at the bedrock surface. These Ordovician sedimentary rocks are highly erodible, yield little water, and are a barrier to vertical groundwater movement. Depth to bedrock in the project area is estimated to be approximately 300 to 400 feet below ground surface.

Unconsolidated deposits that overlie the bedrock are composed of glacial sediment (ground moraine) of Quaternary age. This surficial material was deposited beneath glacial ice during its advance and retreat as a blanket of unsorted rock debris of irregular thickness, ranging in size from clay to boulders. Ground moraine usually has moderate relief and forms a gently undulating plain with no definite alignment to the undulation.

Soils in the region are lime-rich glacial tills overlain in most areas by fine particles of wind-blown loess. Soils are mapped in **Figure 2,** showing glacial upland materials consisting of loamy clays with some sand and gravel. The primary soil association is the Miami–McHenry soils. These soils are well drained with a subsoil of clay loam and silty clay loam.

The land cover and the slopes of the land affect annual soil erosion rates for the project area. **Figure 3** illustrates the extent of the four land cover types in the Indian Hills area (agricultural, forest, open space, and residential area) and the associated average annual erosion rates. Areas of greater slope and potentially higher soil erosion are shown in **Figure 4**.

The Walworth County Soil Survey shows the study area soils characterized by loams and clay loams. The survey lists the estimated soil permeability by layers. **Figure 5** illustrates the limiting soil permeability in the top 60-inches of the soil column.

2.1.3 TOPOGRAPHY

The topography of the project area varies from flat or gently rolling grades to steep slopes of 20% grade or more. The project is located on a north-facing slope between agricultural lands to the south and Lake Geneva to the north. A single-family residential development is west of the project area, and another single-family residences and a golf course are to the east.

Surface elevations in the project area have a range of approximately 130 feet ranging from 1000 feet (NGVD) in the south to 870 feet in the north near the lake. The topography illustrated in **Figure 6** changes smoothly from nearly flat to steep, beginning about 0.75 mile south of Lake Geneva, where the land slopes more steeply downward towards the lake.

2.1.4 VEGETATION

Vegetation in the Southeast Glacial Plains region historically consisted of a mix of prairie, oak forests and savanna, and maple-basswood forests. Wet mesic prairies, southern sedge meadows, emergent marshes, and calcareous fens were found in lower portions of the landscape. Glacial end-moraines (long low ridges of glacial till) and glacial drumlins (long hump-like hills) supported oak savannas and mesic forests.

Agricultural and urban land-use practices have drastically changed the land cover since Euro-American settlement. The current vegetation is primarily agricultural cropland and deciduous woods. Remaining forests occupy only about 10 percent of the land area and consist of maple-basswood, lowland hardwoods, and oak. Many existing forest patches in the region formerly were oak savannas that have succeeded to mixed hardwood forest as a result of fire suppression.

Endangered resources are identified on Natural Heritage Inventory (NHI) maps, which provide a general reference to identify areas with known occurrences of endangered resources. The NHI maps for Walworth County (2005) do not identify the specific locations of endangered resources, but rare aquatic and terrestrial species or natural communities have been documented at unspecified locations on the south shore of Lake Geneva.

A small wetland area may exist within a forested drainage way within the project area.

Much of the vegetation of the project area consists of urban and rural residential landscaping varieties. Approximately 60 percent of the project area is developed, primarily with single-family residences. Agricultural fields and woodlands extend from the residential area to the southern boundary of the project area.

2.1.5 GROUNDWATER RESOURCES

Groundwater aquifers in southeast Wisconsin, listed in order of depth below ground surface, are the surficial sand-and-gravel aquifer, the Niagara aquifer, the Galena Platteville aquifer, and the sandstone aquifer.

The depth to surficial groundwater is expected to vary throughout the project area from a depth of 50 feet below ground surface in southern portion to discharge/recharge area at the ground surface at the lakeshore. In addition, local hydrogeologic conditions, including the springs and many intermittent streams, also influence local groundwater flow.

The sand-and-gravel aquifer provides potable water to wells in the area. This glacial outwash deposit is 0 to 300 feet thick, with a buried sand-and-gravel layer reported to be 0 to 100 feet thick. Well yields reported at more than 1,000 gallons per minute are a predominant feature. This aquifer is recharged from the surface and discharges to lakes and streams.

2.1.6 SURFACE WATER

The area of study includes an intermittent stream that is designated as navigable water, requiring permits from the State of Wisconsin for most activities in and adjacent to the stream. **Figure 7** illustrates the stream from a pond in Abbey Springs Country Club until it terminates at Lake Geneva. The total drainage area of the stream is about 230-acres, of which about 214-acres drain to South Lake Shore Drive.

2.1.7 UNIQUE FEATURES AND SCENIC AREAS

Lake Geneva is a mesotrophic, deep-water, spring feed lake with an average depth of 61 feet and a maximum depth of 135 feet. The 5,262-acre lake consists of one basin with five bays. The lake is approximately 7.4-miles long, an average width of 1.25-miles wide. Its high length-to-width aspect offers long views to points east and west, as well as a relatively long fetch that allows predominately southeast winds to push waves and ice against the northwest shore.

For viewers on the shoreline of the Village of Fontana, a view across the lake to the north and west offers a large, long open lake with a shoreline of low intensity housing.

2.1.8 FISH AND WILDLIFE HABITAT

Lake Geneva provides habitat for common species of game fish and pan fish, with relatively low populations of rough fish. The developed shoreline of the lake provides a small amount of wildlife habitat. The project area is located in a wooded sub-division that also provides a small amount of wildlife habitat and cover. There are environmental corridors in the southern and

eastern portions of the project area that provide a movement corridor and cover for wildlife in the area.

2.1.9 WATER BASED RECREATION AREAS

Recreational use of Lake Geneva is typical for lakes in southeastern Wisconsin, with a variety of users sharing the resource. Types of uses include motor boating, skiing, tubing, fishing, sailing, canoeing, kayaking, swimming, skin and scuba diving, and similar activities.

2.2 BUILT ENVIRONMENT

2.2.1 DEVELOPMENT/LAND USE

The project area is located in the Village of Fontana on Lake Geneva in the Indian Hills subdivision. The area is a 230-acre sub-watershed located near the southwest corner of Lake Geneva. The area consists of an urban residential neighborhood with moderate density. The area also has moderate tree cover. The area is not serviced by storm sewers or open storm-water ditches; as a result much of the runoff is dispersed as overland flow.

Figure 8 illustrates development in the project area that is mostly residential, with small areas of open space on the south and east side of the project area. A small portion of the Abbey Springs Country Club is also located on the east side of the project area. Residential development north of Lake Shore Drive is denser than development on the south side of the project area.

The Village of Fontana's Comprehensive Land Use Plan identifies environmental corridors on the south and east sides of the project area. Lake Geneva is also considered and environmental corridor. Generally, environmental corridors consist of surface waters, their undeveloped shorelands and floodlands, wetlands, wildlife habitats, rugged terrain and high relief topography. Benefits of environmental corridors that are "vital to maintaining a good quality of life" include maintenance of surface and groundwater quality and reduction of soil erosion.

The Village of Fontana's "Comprehensive Plan: 2001," September 2001, states the following objectives for future development of the Village of Fontana: 1) Create a visually attractive and distinctive community, 2) Achieve a rational and orderly Village development pattern that retains the community's traditional low density residential character, 3) Achieve a mix of commercial development that meets the needs of Village residents as well as visitors to the community while at the same time being compatible with the traditional low density residential character of the Village, 4) Preserve and enhance the community's environmental resource base, 5) Develop a Village street system that facilitates safe, convenient and efficient traffic flow that is compatible with residential low density character of the Village, 6) Provide park and

recreation facilities that are accessible to all village residents as well as visitors, and 7) Establish a pedestrian and bikeway trail system through the Village.

2.2.2 ZONING

Most local zoning is administered by Village of Fontana and Walworth County ordinances, all under State of Wisconsin requirements and guidance. The bulk of the project area is zoned for single-family residential development. There are small areas on the south and east side of the project area that are zoned for parks/active recreation and environmental corridors. None of the project area is zoned for commercial or industrial development.

Ordinances to regulate development in the project area include the following:

State of Wisconsin

- Uniform Dwelling Unit Code for construction of one- and two-family dwellings.
- NR 151 establishes runoff pollution standards for non-agricultural facilities and transportation facilities, performance standards and prohibitions for agricultural facilities and practices designed to achieve water quality standards as required by s.281.15 (2) and (3).
- NR 152 model ordinances for construction site erosion control and post-construction storm water management.
- NR 216 establishes criteria defining storm water discharges needing WPDES storm water permits as required by s.283.33 and to implement the appropriate performance standards of subchapters III and IV of chapter NR 151.

Walworth County

- Subdivision Control Ordinance for design of lots, subdivision access, and related improvements.
- Storm Water Management Ordinance to provide long-term, post-construction storm water management to help protect public health and safety and the aquatic environment. It outlines storm water management requirements and provides guidance and standards for storm water controls.
- One- and Two-Family Dwelling Construction Site Erosion Control and Storm Water Management Ordinance to protect surface water quality by reducing sediments and other pollutants leaving construction sites.
- Land Disturbance, Construction Site and Sediment Control Ordinance to preserve the natural resources, protect the quality of the waters of the county and the state, and protect and promote the health, safety and welfare of the people by minimizing the amount of sediment and other pollutants carried by runoff.

Village of Fontana on Lake Geneva

- Building Ordinance to adopt state codes and local authority for site development.
- Property Maintenance Ordinance to protect public health, safety, and welfare by establishing minimum property maintenance standards.

- Shoreline Regulation Ordinance to regulate the tree cutting, earth movements, shoreline setbacks, boathouses, patios, retaining walls, piers, agricultural practices, surface water discharge, drainage and withdrawal and waste material in proximity of surface water.

2.2.3 STREETS

The major routes to access the Village of Fontana are State Highway 67 that runs north-south along the western side of the Village and County Highway B that runs in an east-west direction along the southern border of the community.

Within the project area are numerous privately owned roads serving the residential development. The public roads used to access the project area are Indian Hills Road and South Lake Shore Drive.

2.2.4 WATER SUPPLY

The project area is served by a municipal water supply system operated by the Village. Three wells in the system are drilled to approximately 150 feet below ground surface and a fourth is drilled to approximately 1,600 feet deep. Two of the wells are located north of Dewey Avenue on the west side of the Village. The remaining two wells are located in Country Club Estates at the southeast corner of Tarrant Drive and Mayflower Lane.

2.2.5 WASTEWATER TREATMENT

A municipal wastewater treatment system treats the wastewater in the Village of Fontana. The treatment plant is operated by the Fontana-Walworth Water Pollution Control Commission and is located west of the Village of Fontana along the Piscasaw Creek. The wastewater treatment plant has a design capacity of 1.7 million gallons per day. According to the Village of Fontana-on-Geneva-Lake Comprehensive Plan 2001, the average annual flow rate for the entire sewer service area in 1995 was approximately 1.1 million gallons per day. The comprehensive plan indicated that based on current population increases there will need to be an expansion of the treatment plant capacity by 2010.

3.0 EXISTING STORMWATER MANAGEMENT SYSTEM

3.1 FACILITY COMPONENTS

The storm water drainage infrastructure in the project area is non-existent with a few exceptions, consisting of culverts and short reaches of storm sewer. In contrast to municipal storm water systems typically installed in incorporated communities by local public works departments, the project area lacks a system of laterals and collectors like curb and gutter, storm sewers, ditches and swales to bring storm water to a single outfall point.

The exceptions to the absence of drainage infrastructure include a few efforts by residential property owners to direct runoff across their properties with channels. These channels may direct runoff across the property; however they may not have the appropriate cross section for conveyance, bed stability to prevent erosion, and any infiltration capacity to treat storm water runoff.

3.2 DRAINAGE PATTERNS

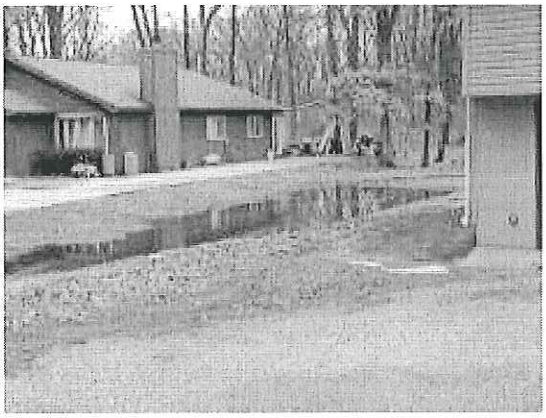
The lack of any storm water drainage infrastructure allows runoff to drain as sheet flow across residential lots and streets, concentrating as channel flow in one area and becoming uncontrolled sheet flow further downstream. Grading for roads, driveways and house pads, with just a few exceptions, didn't account for stormwater runoff control for any portions of the watershed, including the downstream reaches receiving the greatest runoff volume. The roadways and residential development tend to reflect the topography by running parallel to streams and ridges. Undeveloped areas in the watershed drain as sheet flow, which concentrates in natural coulees that in-turn drain to the state-regulated navigable stream. **Figure 7** illustrates the stream location.

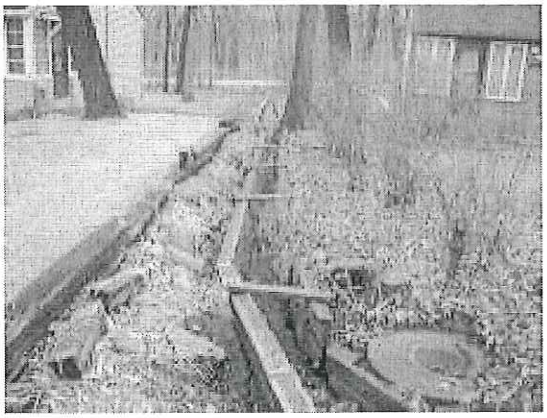
3.3 PROBLEM AREAS

The Village of Fontana, the Wisconsin DNR and private property owners have several concerns regarding storm water runoff from the project area. These concerns include sediments and nutrients reaching Lake Geneva, shallow flooding in roadways causing unsafe vehicular travel, and property damage due to uncontrolled runoff. All of these concerns relate directly to how storm water runoff is managed in the project area.

The 230-acre project area watershed that drains to Lake Geneva includes about 30-acres of impervious surface, most of which is not directly connected to a conveyance system that drains directly to the navigable stream or Lake Geneva. However, these impervious surfaces are a source of increased runoff volume and nutrients because of a lack of an infiltration. The Wisconsin DNR has expressed concern that Lake Geneva's trophic condition is changing from oligotrophic to mesotrophic as indicated by an increase in plant growth. The increase in plant growth is most likely due to an increase in nutrients (primarily phosphorus) that is in turn associated in part with solids. The source of the solids and phosphorus are the areas draining to Lake Geneva, including this project watershed.

The Village of Fontana is concerned with uncontrolled storm water runoff in the watershed. The unmanaged runoff crosses residential lots and roadways as both sheet flow and stream flow, providing risk to homes, the traveling public, emergency vehicles, and roadway stability. Any attempt to control storm water runoff by private citizens has been piecemeal and ineffective. These efforts direct storm water to the downstream edge of their property without regard to additional conveyance. The constructed channels often times have insufficient capacity and/or exacerbate problems for other other residential property owners further downstream.





3.4 WATER QUALITY MODELING

Storm water samples were taken in 1998 and 2000 and tested for unfiltered phosphorus, indicating concentrations typical of urban runoff. However, a comprehensive storm water management plan for long-term monitoring is not in place, requiring an application of a water quality model to estimate pollutant loadings like solids and phosphorus.

In place of extensive monitoring data, pollutant loadings can be estimated using empirical models based on national, regional and local data. However, the unique development characterized by the hydraulically disconnected impervious roadways in this watershed presents a challenge to estimating site specific loadings to Lake Geneva if one uses regional data.

This network of roadways has no curb, gutter, storm sewers, or roadside ditches, requiring a unique water quality program (for example, SLAMM) that can quantify surface water pollutants from disconnected impervious surfaces. This report uses SLAMM to evaluate pollutant loadings from the watershed draining to Lake Geneva under existing conditions. It also uses SLAMM to evaluate the effectiveness of several Best Management Practices (BMPs) under fully developed conditions. The BMPs evaluated to promote upland retention of pollutants include bio-retention and infiltration basins (dry ponds), grassed swales and private rain gardens.

Locations for the dry ponds to serve large areas were few; however three sites are noted in **Figure 9**. The site at South Lake Shore Drive and Indian Hills Road includes a navigable stream regulated by the Wisconsin DNR. The DNR has determined that permanent structures cannot be constructed that will impede the steam. It may be possible, however, to construct dry ponds or bio-retention structures adjacent to the navigable stream to treat runoff from adjacent sub-watersheds. The site does include a wetland, however, so approvals would be required to utilize even a portion of the site.

The other two upland sites for storm water management are not limited by a navigable stream, environmental corridor or wetland designation. All three sites are relatively small and only a small portion of the Indian Hills study area drains to each location. These sites appear to be best suited for infiltration basins or bio-retention structures.

Grassed swales could be constructed throughout the watershed, adjacent and parallel to the private roads and at property lines in between adjacent properties. These swales would direct runoff downstream to other swales and culverts. Swales can be used to control runoff, keeping it away from building foundations and overtopping roadways. The vegetation can also slow the rate of runoff (reducing erosion), filter solids, consume nutrients and promote infiltration.

Infiltration and bio-retention structures could also be used more broadly (i.e. private rain gardens). Rain gardens are very effective in limiting runoff and capturing pollutants. They are best suited, however, in new construction where grading plans can be developed to collect water in the rain gardens. Retrofitting existing development required extensive re-grading that is often not practical.

Table 4 summarizes the estimated reduction of particulate solids and runoff volume for several BMPs. The reductions are in comparison to the watershed as it is currently developed, without curbs, gutters, and storm sewers. Contaminant and runoff reductions were computed using SLAMM. **Appendix B** includes the results of all SLAMM computations used for this report.

Table 4. Stormwater Pollutant Reduction by Best Management Practices

Land Use	Total Phosphorus Reduction, %	Particulate Reduction, %	Runoff Reduction, %
Swales at 135 LF per acre	56	57	57
Swales at 200 LF per acre b	61	62	62
Rain Gardens on 10% of Existing Properties	5	1	1
Rain Gardens on 25% of Existing Properties	7	3	3
Rain Gardens on 50% of Existing Properties	10	6	5
Rain Gardens on 75% of Existing Properties	13	9	8
Rain Gardens on 100% of Existing Properties	17	12	10
Infiltration Basin at South Lakeshore Drive & Indian Hills Road Site	11	55	57
Infiltration Basin south of Sioux Drive between Odsila Way & Indian Hills Road	35	34	35
Infiltration Basin at Aweogon Road Site	53	9	9
Combined BMPs*	84	85	86

* Recommended combined BMPs include swales constructed at 135 LF/'acre and infiltration basins constructed at the South Lakeshore Drive and Aweogon Road sites.

These results indicate that new BMPs can provide additional treatment by reducing particulate solids, total phosphorus, and runoff volume.

None of the BMPs noted in **Table 4** can provide an overall measure of pollutant reduction for the whole watershed. The infiltration structures treat just a portion of the residential areas, requiring additional BMPs such as swales and private rain gardens to treat the remaining portions of the watershed.

4.0 STORMWATER MANAGEMENT GOALS AND POLICIES

To achieve a deliberate and consistent improvement of storm water runoff water quality to Lake Geneva, it is recommended that the Village of Fontana adopt the following goals and policies. These goals and policies are consistent with the concept of Low Impact Development (LID), which requires that new development and redevelopment include BMPs to control runoff rates and volumes. These practices minimize the adverse effects of runoff to downstream property owners and surface water bodies.

4.1 GOALS

- Protect, preserve, and manage natural surface and groundwater storage and retention systems
- Effectively and efficiently manage public capital expenditures needed to correct flooding and water quality problems
- Identify and plan for means to effectively protect and improve surface and groundwater quality
- Establish more uniform local policies and official control for surface water and groundwater management
- Prevent erosion of soil into surface water systems
- Promote groundwater recharge
- Protect and enhance fish and wildlife habitat and water recreational facilities
- Secure the safe and healthful benefits associated with the proper management of surface water and groundwater.

4.2 POLICIES

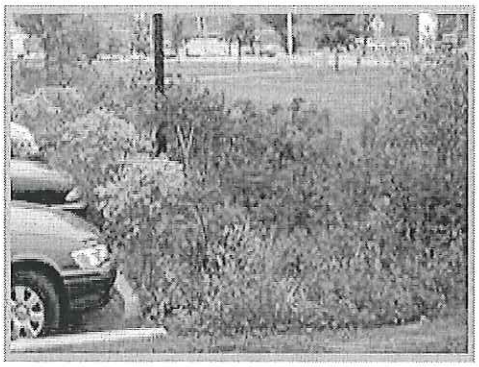
- The Village will promote the concept of LID in order to decrease the adverse effects of runoff from impervious surfaces;
- Advocate minimal impervious areas, disconnecting impervious areas, modifying flow paths to detain runoff, increasing flow paths over pervious surfaces;
- Promote the use of BMPs to improve current conveyance systems;
- Promote the use of BMPs that minimize erosion, increase infiltration, and delay the concentration of runoff;
- Require new development to attain pre-settlement runoff rates;
- Require new and re-development to attain runoff volumes at or below existing conditions;
- Identify and utilize existing, natural retention and detention areas for runoff management while maintaining or improving existing water quality;
- Manage new and redevelopment in accordance with erosion and sediment control ordinances;
- Require private property owners to maintain BMPs as needed for optimum performance in order to minimize public expenditures;

- Encourage the construction of infiltration trenches and basins where feasible and environmentally beneficial to improve runoff quality and recharge subsurface aquifers;
- Educate the public, property owners, developers, consultants, contractors, builders and government officials on runoff BMPs, techniques and regulations for stormwater runoff management;
- Treat all runoff with BMPs in accordance of state standards before discharging to waters of the state.
- Prohibit landscaping in the Village's right-of-way that may reduce flow conveyance in road-side ditches.

4.3 LOW IMPACT DEVELOPMENT

The primary objective of LID is to maintain predevelopment stormwater runoff rates of undeveloped land. The LID approach would aid in protecting the water quality of Lake Geneva, maintaining the ecological, recreational, and economic value of its aquatic resources.

As a watershed is developed, nutrients and pollutants are carried to a downstream water body at increasing rates, with the effects of decreased clarity, algae blooms, and a decline in the aquatic diversity and viability in the lake. This change is directly related to the increase in impervious areas (hard surfaces) that have replaced pervious areas (soft surfaces) such as soils and natural vegetation that would allow rainfall to infiltrate more readily.



To protect downstream water bodies, LID advocates the following goals.

- Provide technology for environmental protection of receiving waters.
- Encourage public education and participation in storm water quality management.
- Incorporate environmental stewardship in new development and redevelopment.
- Reduce construction and maintenance cost of the storm water infrastructure through comprehensive planning for storm water management.
- Include new concepts, technologies, and maintenance methods for improved storm water management in the comprehensive plan.
- Adopt local ordinances that promote innovative engineering, site planning, and management efforts.

Without regulatory controls, in-fill development and redevelopment of existing lots could increase runoff volume and pollutant loads to Lake Geneva. To manage storm water on these sites and help protect existing developed sites, the Village should promote installation of grass-

lined ditches to enhance infiltration and reduce flow rates, run-off volumes and pollutant loads to Lake Geneva. Dedicated infiltration and bio-retention areas on the lots that are separate from the roadside, and grass-lined ditches, should have the capacity to accept runoff from new and existing impervious surfaces. Functional green spaces may also offset the effects of impervious "hard" surfaces. The following recommendations are offered to minimize impervious surfaces and allow green spaces to manage storm water runoff during rainfall and runoff events:

- Reduce road length and width.
- Conserve existing areas of vegetation.
- Minimize disturbance of existing green spaces.
- Preserve areas of soils that offer higher infiltration rates.
- Preserve natural depression areas for infiltration.
- Maintain and expand transition zones between impervious surfaces and wooded areas.
- Install vegetated swales.
- Preserve and maintain existing vegetation on hillsides.

The general practices identified above are intended to decrease the flow of storm water runoff primarily through two mechanisms: infiltration for long-term storage of storm water in soil and groundwater, and transpiration for release of water from vegetation during normal growth processes. In transpiration, plants absorb water in liquid state through their roots and release water vapor through their leaves. Specific practices that promote infiltration and transpiration include the following:

Developers can eliminate curbs and gutters to disconnect impervious surfaces and promote infiltration of storm water on vegetated areas (such as this grass-lined channel in a residential neighborhood)

- On-lot bio-retention with landscape plantings
- Wider and flatter grassed swales
- Broad flat areas to promote sheet flow
- Clusters of trees and shrubs in or near storm water flow pathways
- Conservation of existing tree canopy
- Discontinuous impervious "hard" surfaces separated by turf and/or taller vegetation, including grasses, shrubs, and trees
- Surface modifications to ease the slopes of existing steep topography
- Installation of infiltration zones with taller vegetation along slopes.

To support comprehensive LID, conservation BMPs offer specific design features that may improve surface runoff quality. Many BMPs reduce runoff (and associated pollutants) by intercepting rainfall before runoff begins. Examples are:

- Bio-retention features
- Filter/buffer strips
- Swales: grass, infiltration
- Rain barrels
- Infiltration trenches

Table 5 ranks each BMP for its value in water management functions, which are physical processes that can reduce runoff rates, runoff volumes, and improve runoff water quality. LID depends heavily on these water management functions to reduce the adverse effects of storm water runoff.

A narrow street in a residential neighborhood. Cars can be parked in driveways or along the road shoulder

Table 5. Value of Storm Water Management Functions

BMP Water Management Function	Bio-retention	Filter/Buffer Strip	Grass Swale	Rain Barrel	Infiltration Trench
Interception	H	H	M	N	N
Depression Storage	H	H	H	N	M
Infiltration	H	M	M	N	H
Ground Water Recharge	H	M	M	N	H
Decrease Runoff Volume	H	M	M	L	H
Decrease Peak Runoff Rate	M	L	M	M	M
Decrease Runoff Frequency	H	M	M	M	M
Improve Runoff Water Quality	H	H	H	L	H
Increase Base Flow of Streams	M	H	M	M	L
Increase Stream Quality	H	H	M	N	H

H = High M = Moderate L = Low N = None

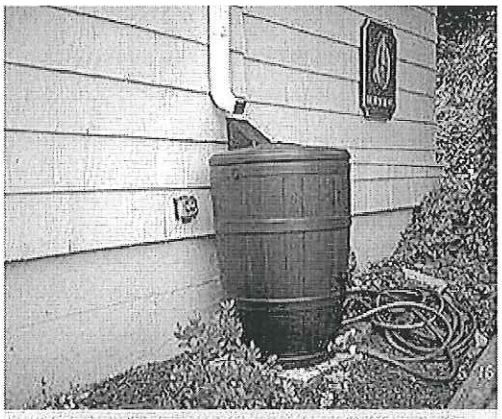
Table 6 shows the relative effectiveness of each of the BMPs in reducing storm water pollutants as reported in technical literature.

Table 6. Reduction of Common Storm Water Pollutants

Pollutant / BMP	Total Suspended Solids %	Total Phosphorus %	Total Nitrogen %	Zinc %	Lead %	BOD %	Bacteria %
Bio-retention	-	81	43	99	99	-	-
Infiltration Trench	80-100	40-60	40-60	80-100	80-100	60-80	60-80
Filter/Buffer Strip	20-100	0-60	0-60	20-100	20-100	0-80	-
Vegetated Swale	30-65	10-25	0-15	20-50	20-50	-	Neg.
Infiltration Swale	90	65	50	80-90	80-90	-	-
Rain Barrel	NA	NA	NA	NA	NA	NA	NA
Wet Retention Pond	80-90	40-70	NA	40-80	80-90	NA	NA

Source: CRC, 1996; Davis et al, 1997; MWCG, 1987; Urbonas & Stahre, 1993; Yousef et al, 1985; 1992; 1993.

If and when new development occurs in the upland area of the Indian Hills study area, new storm water infrastructure will be needed to protect the environmental corridor and intermittent streams that flow to Lake Geneva. LID and its BMPs are recommended to manage runoff rates and volumes in the new development area and any redevelopment or infill areas.



A rain barrel is used to collect rooftop runoff using a gutter/downspout system

Regulatory controls under LID should limit the post-construction runoff rates to no more than pre-development rates for the 2-, 10-, 25-, 50- and 100-year storm events for all new developments 1.0 acres or more in size or creating 0.5 acres or more of new impervious surfaces, and infill development or re-development of 5,000 square feet or more in size.

5.0 CRITICAL NEEDS

5.1 REGULATORY CONTROLS

Regulatory controls to manage surface water quality affecting Lake Geneva are in place at three levels of government: State of Wisconsin, Walworth County, and the Village of Fontana. Chapters NR151 and NR216, Wisconsin Administrative Codes, require stormwater management for development projects. Walworth County ordinances require erosion and sediment controls in building permits. The Village of Fontana relies on state and county regulations for stormwater quality management but has no ordinance of its own to address stormwater quantity and quality management in the privately managed residential neighborhoods.

5.2 ADEQUACY OF STORM WATER MANAGEMENT PROGRAMS

Requirements for runoff management addressed in Chapters NR 151 and 152, Wisconsin Administrative Codes, provide frameworks for controlling polluted runoff from agricultural practices, stormwater drainage, and other non-point sources. These comprehensive rules require reductions in polluted runoff from farms, cities, and construction sites, now regarded as the largest remaining pollution threat to Wisconsin's waters.

Walworth County's Storm Water Management ordinance regulates post-construction storm water discharges by establishing storm water management standards, plan and permit requirements, and procedures to implement and maintain long-term storm water best management practices. It sets design and performance standards for BMPs and addresses regulation through review, permitting, inspection and enforcement. The provisions of this ordinance apply to any development activity that disturbs one or more acres or results in the addition of 0.5 or more acres of impervious surface.

This ordinance is sufficient and appropriate for most communities, but the Village of Fontana faces a unique circumstance not adequately addressed by the ordinance. The Indian Hills study area is mostly developed without the storm water infrastructure to convey additional runoff rates and volumes. Properties and roadways are flooded under existing conditions. New development in the upstream portion of the watershed will increase storm water runoff rates and volumes. The potential exists for significant infill development. The Village should apply the Walworth County storm water ordinance to even smaller in-fill development (<1 acre) to limit the amount of increased runoff as the area develops further.

5.3 ADEQUACY OF SOIL EROSION PROGRAMS

Walworth County controls land disturbance activities, including erosion control, with two ordinances. The Walworth County Land Disturbance, Construction Site and Sediment Control

ordinance applies to all construction sites disturbing 4,000 square feet of surface area or more or involving the excavation of filling of 400 cubic yards or more, among others. One- and two-family dwelling units are exempted, but are regulated by the One- and Two-Family Dwelling Construction Site Erosion and Sediment Control and Storm Water Management ordinance. These ordinances are sufficient and appropriate for the Village of Fontana.

5.4 ADEQUACY OF CAPITAL IMPROVEMENT PROGRAMS

Due to the extensive degree of private ownership of roads and property in the Indian Hills project area; the Village does not have rights-of-way along roadways or drainage easements between properties. These are typically needed by municipalities to construct, maintain and operate storm water drainage systems to safely carry surface water runoff away from private property and roadways.

The Village of Fontana has no dedicated funding mechanism to pay for storm water capital improvements. The general fund or special assessments are used to pay for all municipal capital improvements. Some communities have dedicated funds that are maintained through a storm water assessment according to a measure of impervious surface or other measure. These assessments serve as a "user fee" for storm water system improvements and on-going operation and maintenance.

The Village of Fontana has no public educational program related to storm water runoff and its impact on the water quality of Lake Geneva. The State of Wisconsin, Extension Service has a wealth of information in the form of brochures that illustrate the value of storm water controls, and show private property owners what they can do on their own land to help control storm water runoff rates, runoff volumes, and water quality before it leaves their property. The Village could provide this information at the village hall or through mailings.

5.5 FUTURE POTENTIAL PROBLEMS

As development continues in the region and the project area, new development and redevelopment will increase the amount of impervious surfaces that ultimately drain to Lake Geneva. Without thoughtful guidance, new impervious surfaces will increase runoff rates and runoff volumes to the lake, with more pollutant mass discharged to the lake.

The dispersed storm water conveyance system in the Village is reasonably stable with a few exceptions as noted in the Section 6 of this report. The navigable stream discussed earlier will convey higher rates and volumes of runoff if the upland agricultural areas develop with impervious surfaces. These changes will increase the rate of channel erosion and increase the

flood hazard in the existing community. To avoid this degradation, the community will need to implement BMPs that mitigate these adverse impacts.

6.0 IMPLEMENTATION PROGRAM

6.1 REGULATORY CONTROLS

With the revision of Walworth County ordinances related to storm water and erosion control, regulatory controls are generally in place and sufficient. It is recommended the Village apply some of these controls to smaller infill development projects than the County ordinance requires. In addition, the Village should consider creating a storm water utility to generate revenues to pay for new infrastructure and on-going maintenance, and adopting a lawn fertilizer ordinance to limit the use of phosphorus on lawns. Specific recommendations are:

- Adopt the Walworth County Storm Water Ordinance, modifying it to apply to infill development disturbing 5,000 square feet or more. This ordinance would manage storm water runoff rate and volumes for in-fill and new development. It also would provide a buffer area adjacent to protected areas.

- Consider creating a storm water utility. This would provide a source of capital for storm water projects and on-going operations and maintenance of the storm water conveyance and treatment system.

- Adopt a Lawn Fertilizer Ordinance. This ordinance would regulate the use of phosphorus in fertilizer in the community.

6.2 INFORMATION PROGRAM

The University of Wisconsin Extension provides several environmental publications that inform citizens about good management practices that effect storm water runoff and the water quality of a receiving water body. The subjects that these publications cover ranges from lawn care to shoreline bank stabilization; discussing common sources of lake pollutants and practices that property owner's can take to reduce pollutants. These program materials can be disseminated through public meetings, information packets provided to new residents, display racks at the village hall, direct mailings, and copied from the Internet. The following list includes publications that are written for citizens and can be purchased or copied from the UW Extension Publications web site by going to Natural Resources on the menu bar and then clicking on Environmental Resources Center.

- Lawn and Garden Fertilizers – GWQ002
- Lawn and Garden Pesticides – GWQ011
- Lawn Weed Control – GWQ013
- Managing Leaves and Yard Trimmings – GWQ022

- Rethinking Yard Care – GWQ009
- Rain Gardens: A Household Way to Improve Water Quality – GWQ 034
- Rain Gardens: A How-To Manual for Homeowners – GWQ037
- Pet Waste and Water Quality – GWQ006
- Car Care for Cleaner Water – GWQ0019
- Shoreline Plants and Landscaping – GWQ014
- Fresh Look at Shore Land Restoration – GWQ027
- Protecting and Restoring Shore Lands – GWQ038
- Protecting our Living Shores – GWQ039
- Protecting Your Waterfront Investment, 10 Simple Shore Land Stewardship Practices – GWQ044

It is recommended the Village of Fontana begin a public education program based on these materials. It can be used to raise awareness or of flooding and water quality issues and what individual homeowners can do to help solve these problems. It will also support compliance with new and existing ordinances (lawn fertilizers and pet waste) and promote the concept of rain gardens (bio-retention structures) on private properties. Public awareness will also help build support for needed capital improvements and potentially for a storm water utility.

6.3 CAPITAL IMPROVEMENTS

Construction of a storm water retention basin on the intermittent stream north of Lake Shore Drive would have the most beneficial water quality benefit of all the capital improvements evaluated. However, the State has determined that an in-steam structure cannot be constructed in this location. Therefore, the recommended capital improvements include a combination of upstream measures. These include:

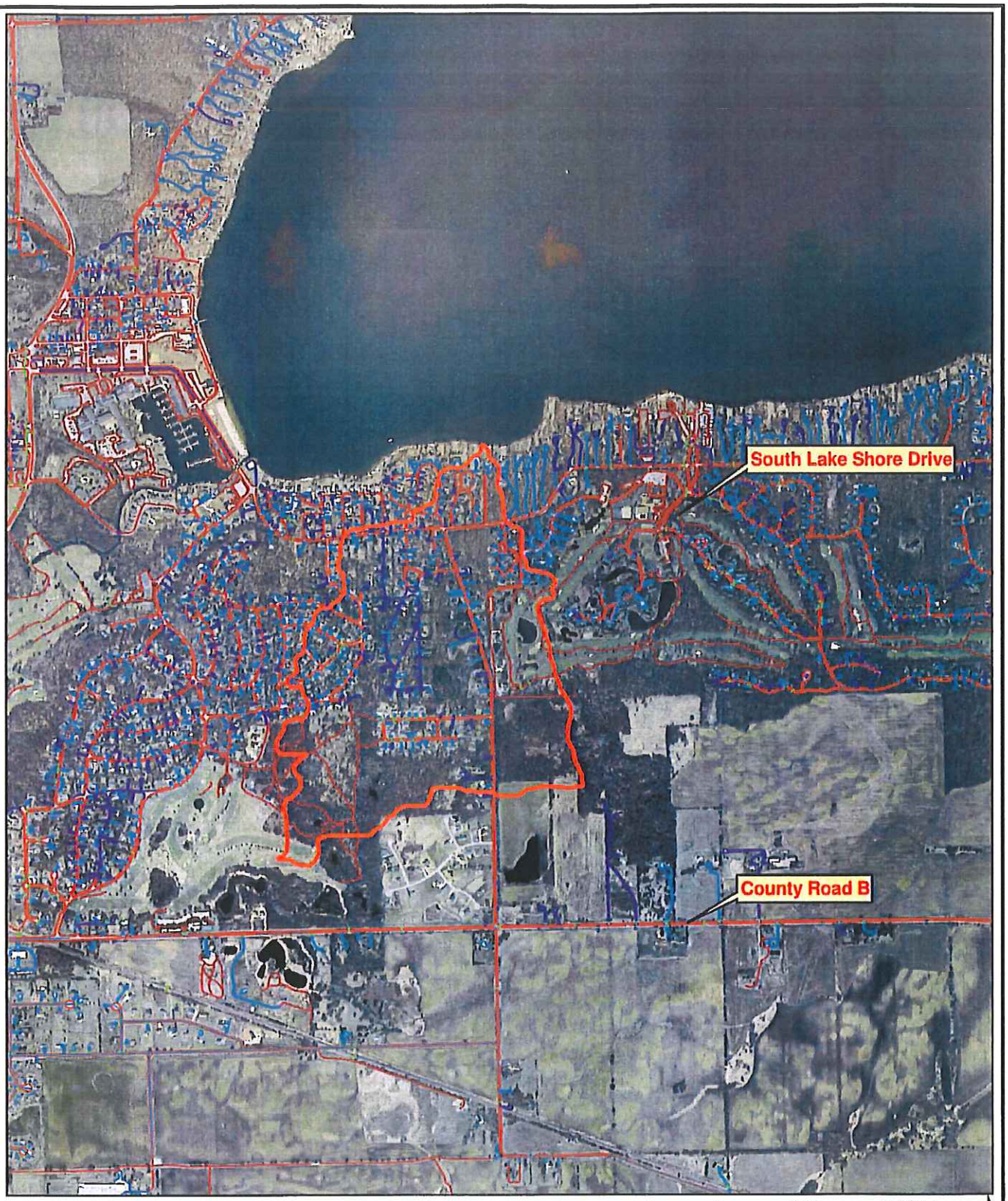
1. Construction of bio-retention and infiltration facilities adjacent to the navigable stream at the South Lakeshore Drive and Indian Hills Road site to serve the local sub-watershed draining to the stream from the east.

2. Construction of bio-retention and infiltration facilities on two upland parcels that currently flood and hold stagnant water. This is referred to as the Aweogon Road site.

3. Construct a network of roadside and private property line swales (approximately 135 linear feet per acre for developed properties).

4. Construct or subsidize bio-retention structures (rain gardens) on private properties that have low-lying areas that currently experience temporary flooding and hold pools of stagnant water.

Figure 9 illustrates the locations for these recommended improvements.



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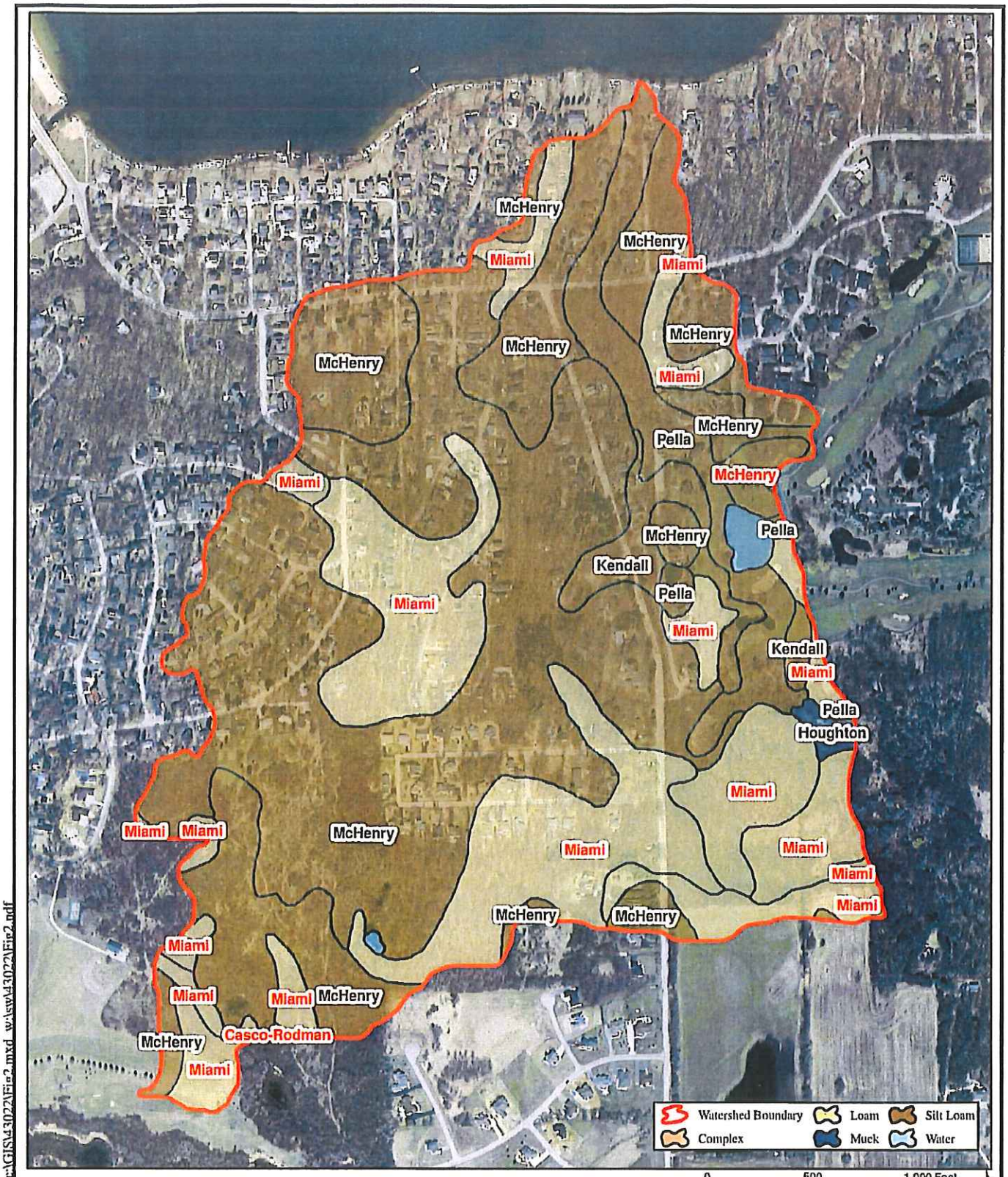
LIESCH Hydrogeologist Engineers Environmental Scientists 6000 Gisholt Drive, Suite 203, Madison, WI 53719, (608)223-1532 13400 15th Ave. N, Minneapolis, MN 55441, (763)489-3100 4300 N. Miller Rd. Suite 211, Phoenix, AZ 85251, (480)421-0853	Area of Study	Nov 06
	Town of Fontana Storm Water Management Plan	Figure 1



Source: Walworth County Information Systems Department, 2005 NAIP Orthophoto
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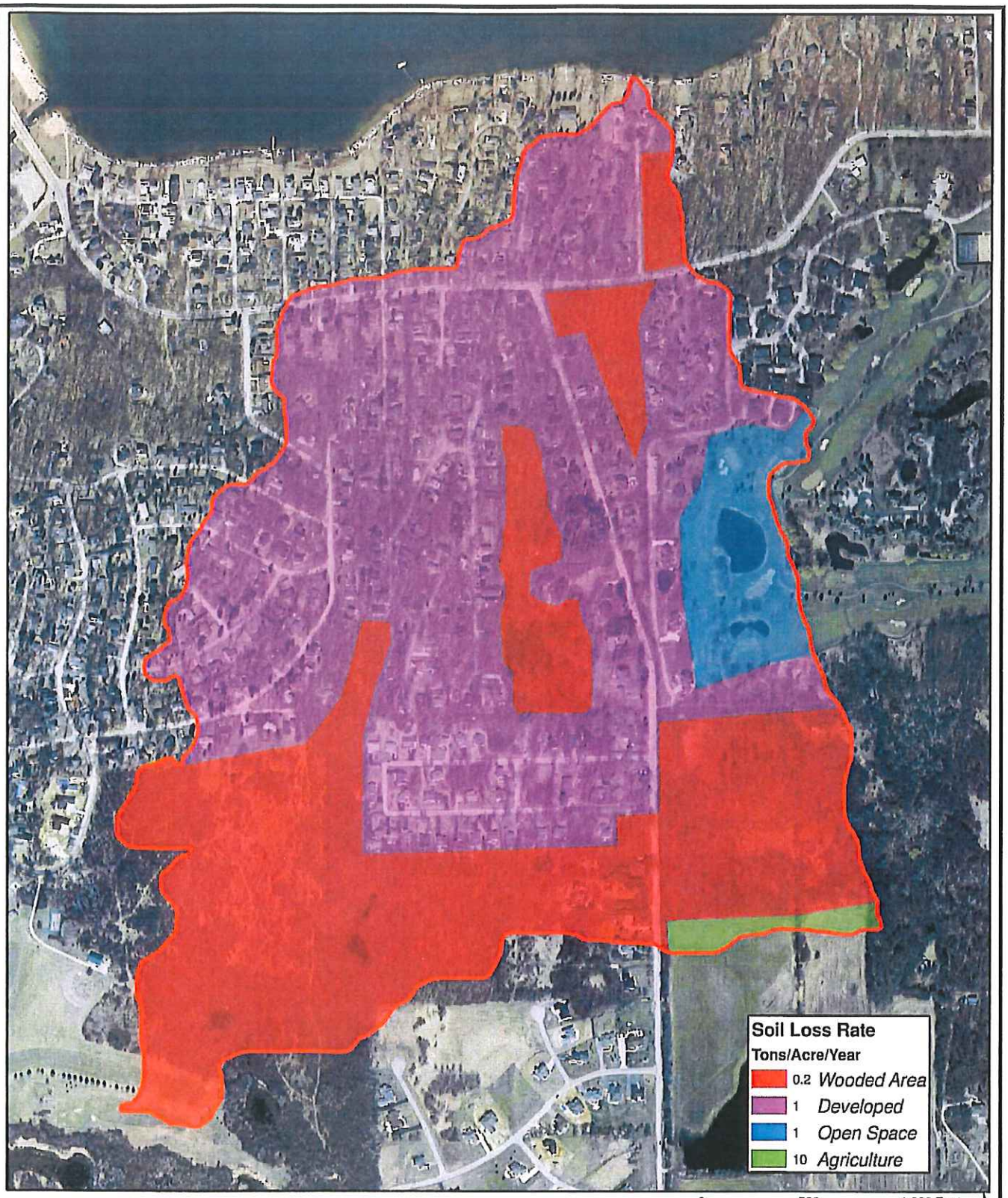
USDA Soils	Nov 06
Town of Fontana Storm Water Management Plan	Figure 2



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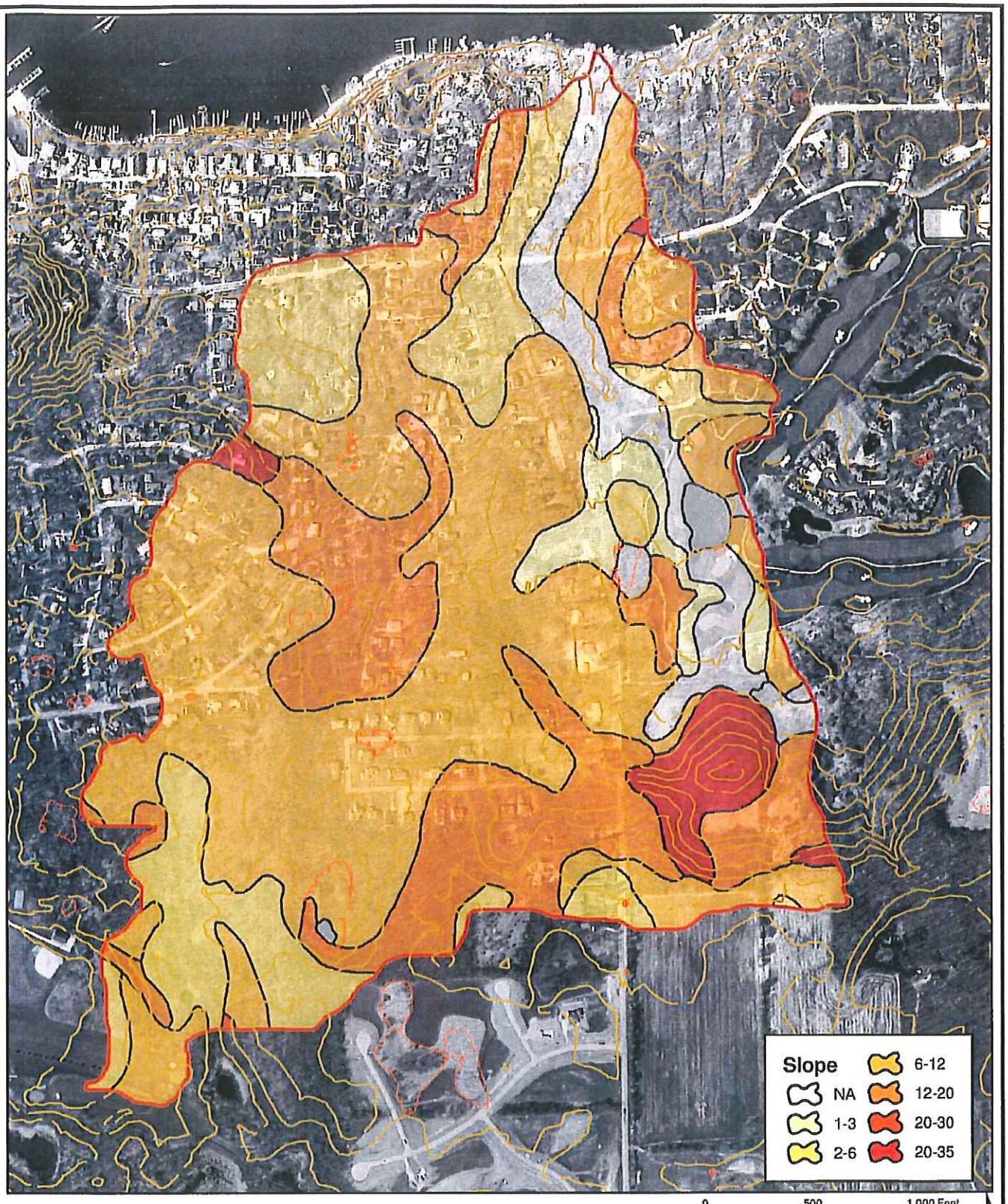
Average Annual Soil Loss	Nov 06
Town of Fontana Storm Water Management Plan	Figure 3



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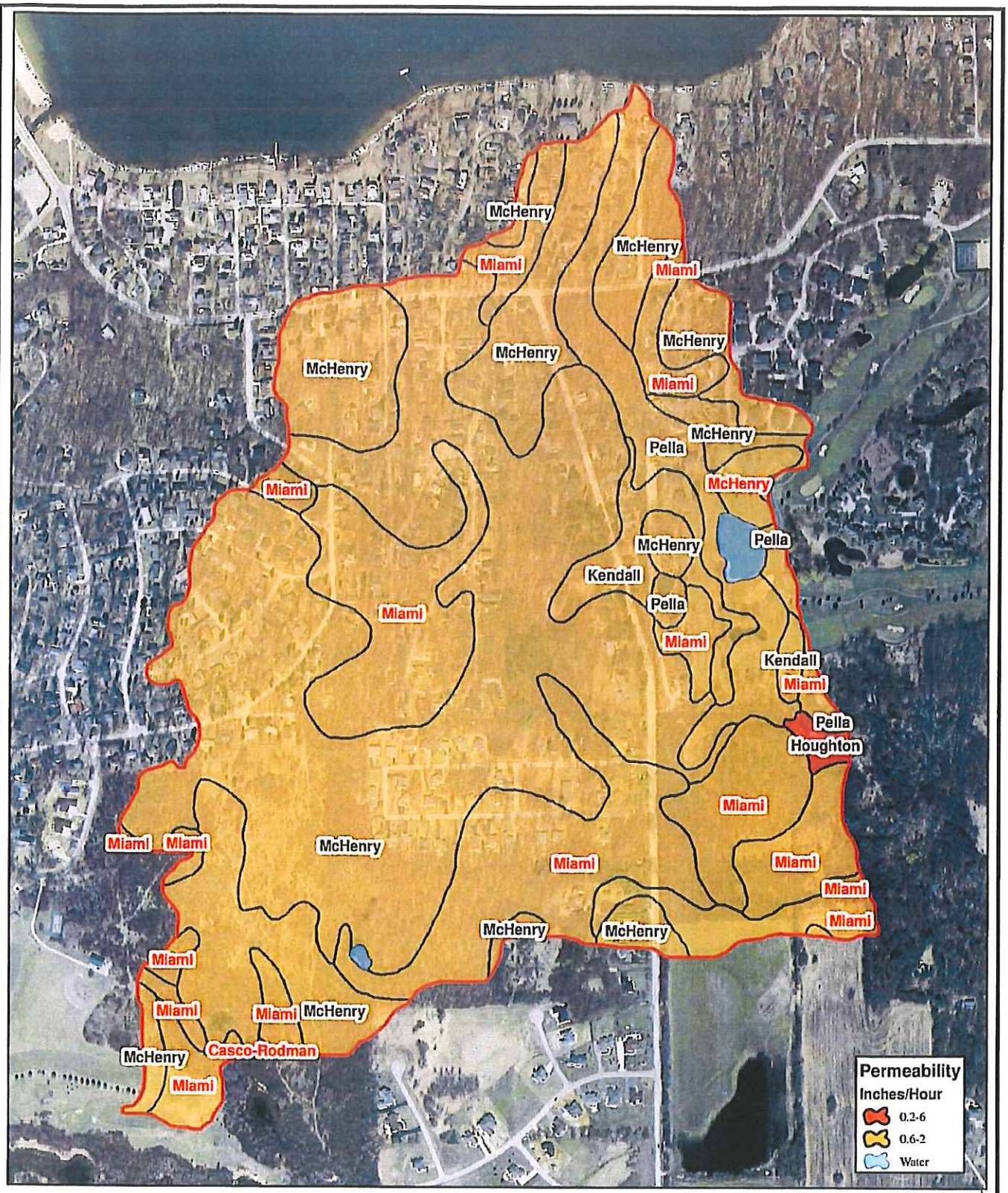
Average Land Form	Nov 06
Town of Fontana Storm Water Management Plan	Figure 4



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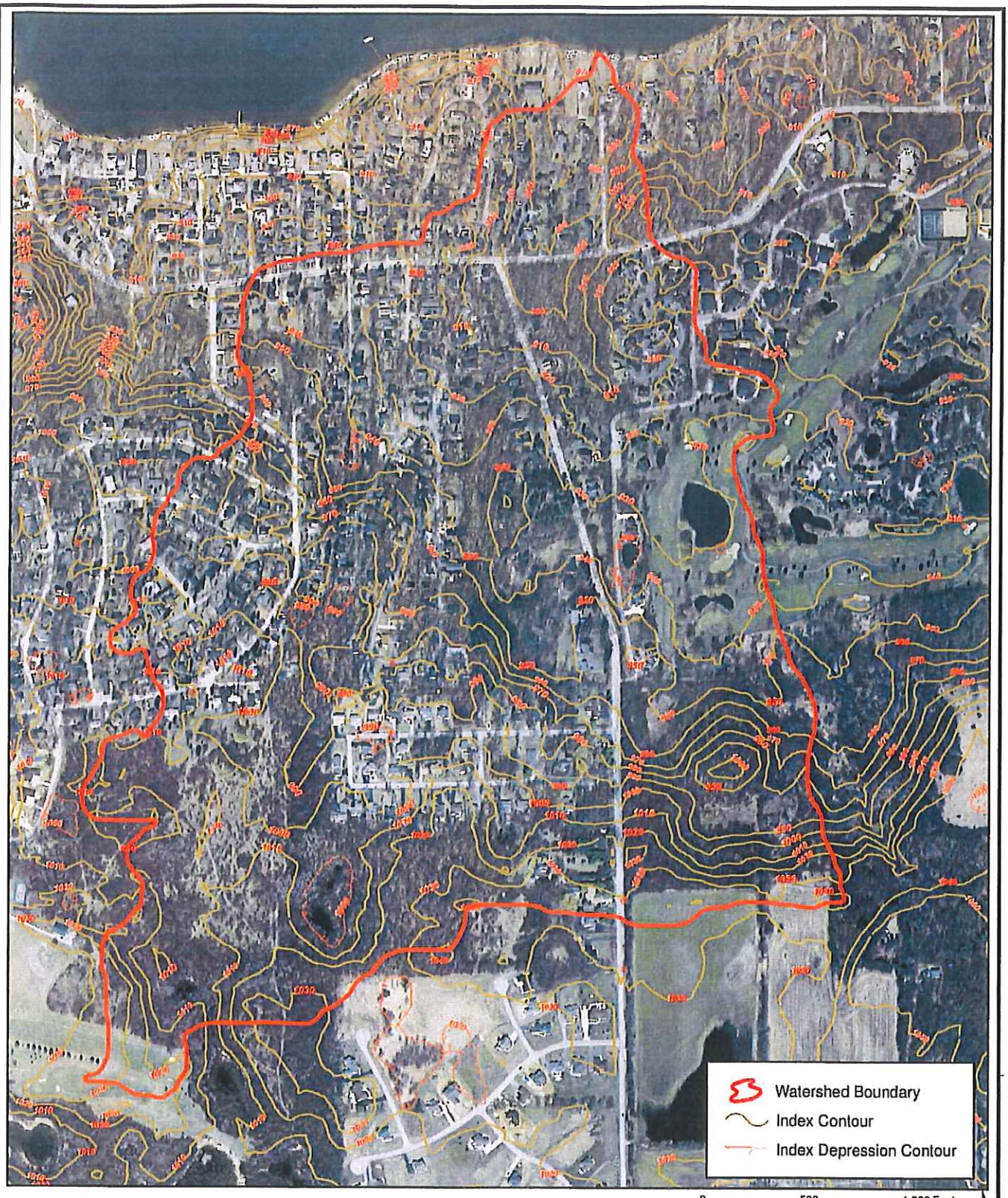
Limiting Permeability in Top 60" of Soil Column | Nov 06

Town of Fontana
Storm Water Management Plan

Figure 5



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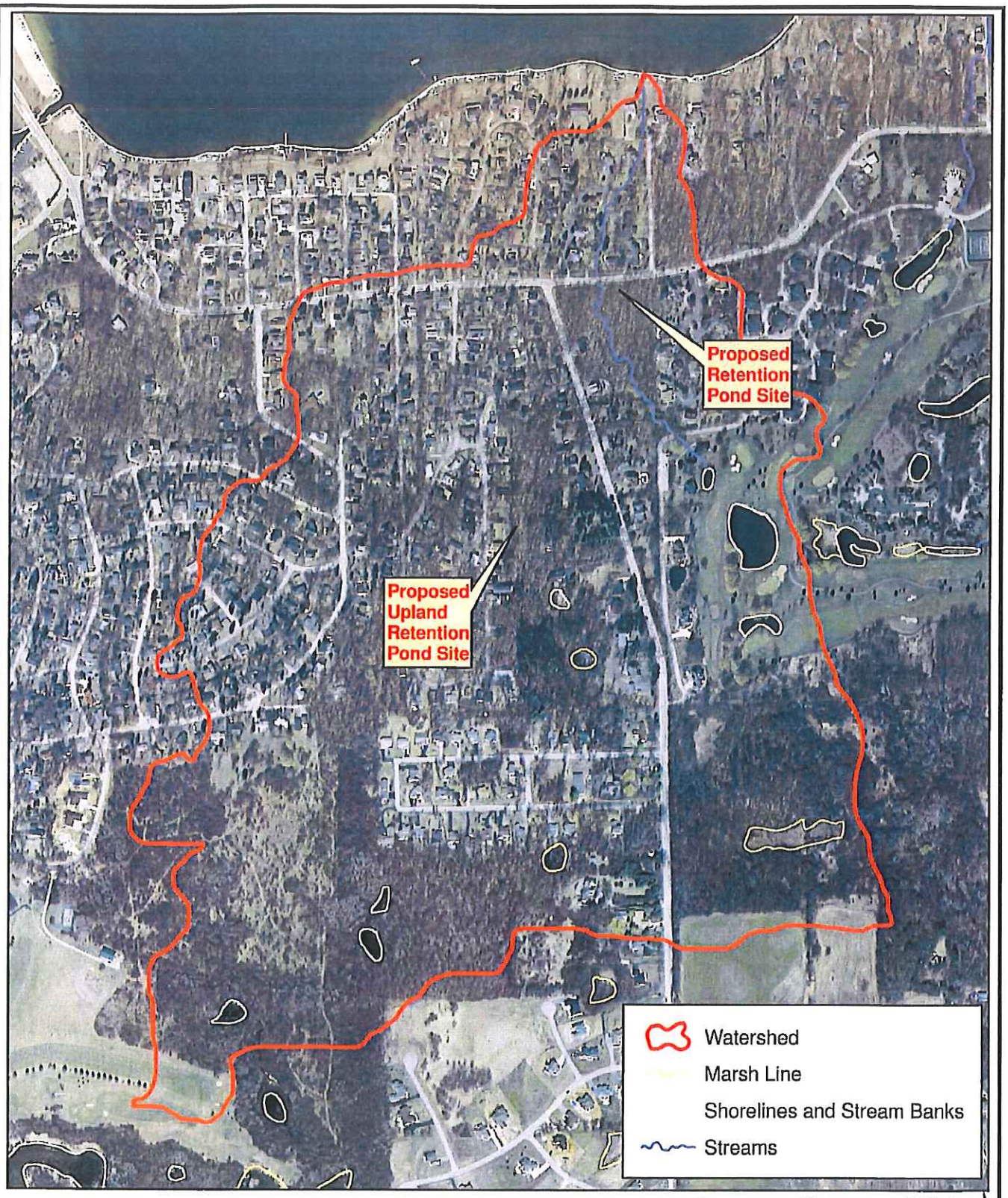
Average Land Form	**Nov 06**
Town of Fontana Storm Water Management Plan	**Figure 6**



Source: Walworth County Information Systems Department
Projection: NAD 27 State Plane Wisconsin South

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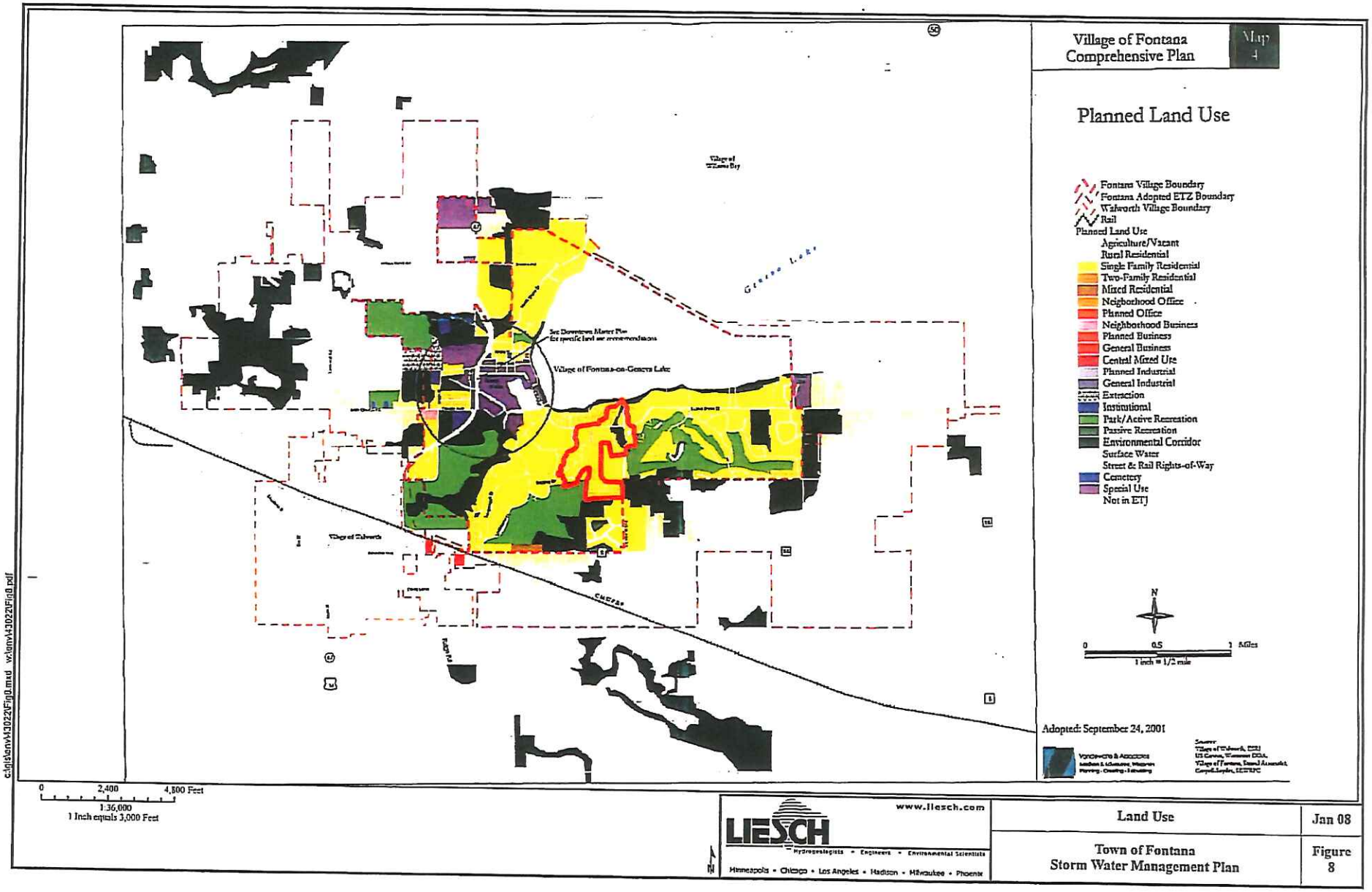
Intermittant Streams | **Nov 06**

Town of Fontana
Storm Water Management Plan | **Figure 7**


Village of Fontana Comprehensive Plan
Map 4
Planned Land Use
Fontana Village Boundary
Fontana Adopted ETZ Boundary
Walworth Village Boundary
Rail
Planned Land Use
Agriculture/Vacant
Rural Residential
Single Family Residential
Two-Family Residential
Mixed Residential
Neighborhood Office
Planned Office
Neighborhood Business
Planned Business
General Business
Central Mixed Use
Planned Industrial
General Industrial
Extraction
Institutional
Park/Active Recreation
Passive Recreation
Environmental Corridor
Surface Water
Street & Rail Rights-of-Way
Cemetery
Special Use
Not in ETJ
See Downtown Master Plan for specific land use recommendations
Village of Fontana-on-Geneva Lake
Geneva Lake
CMSTP&P
N
0
0.5
1 Miles
1 Inch = 1/2 mile
Adopted: September 24, 2001
0
2,400
4,800 Feet
1:36,000
1 Inch equals 3,000 Feet
c:\gis\envi\30220Fig8.mxd w:\envi\30220Fig8.pdf
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Land Use
Jan 08
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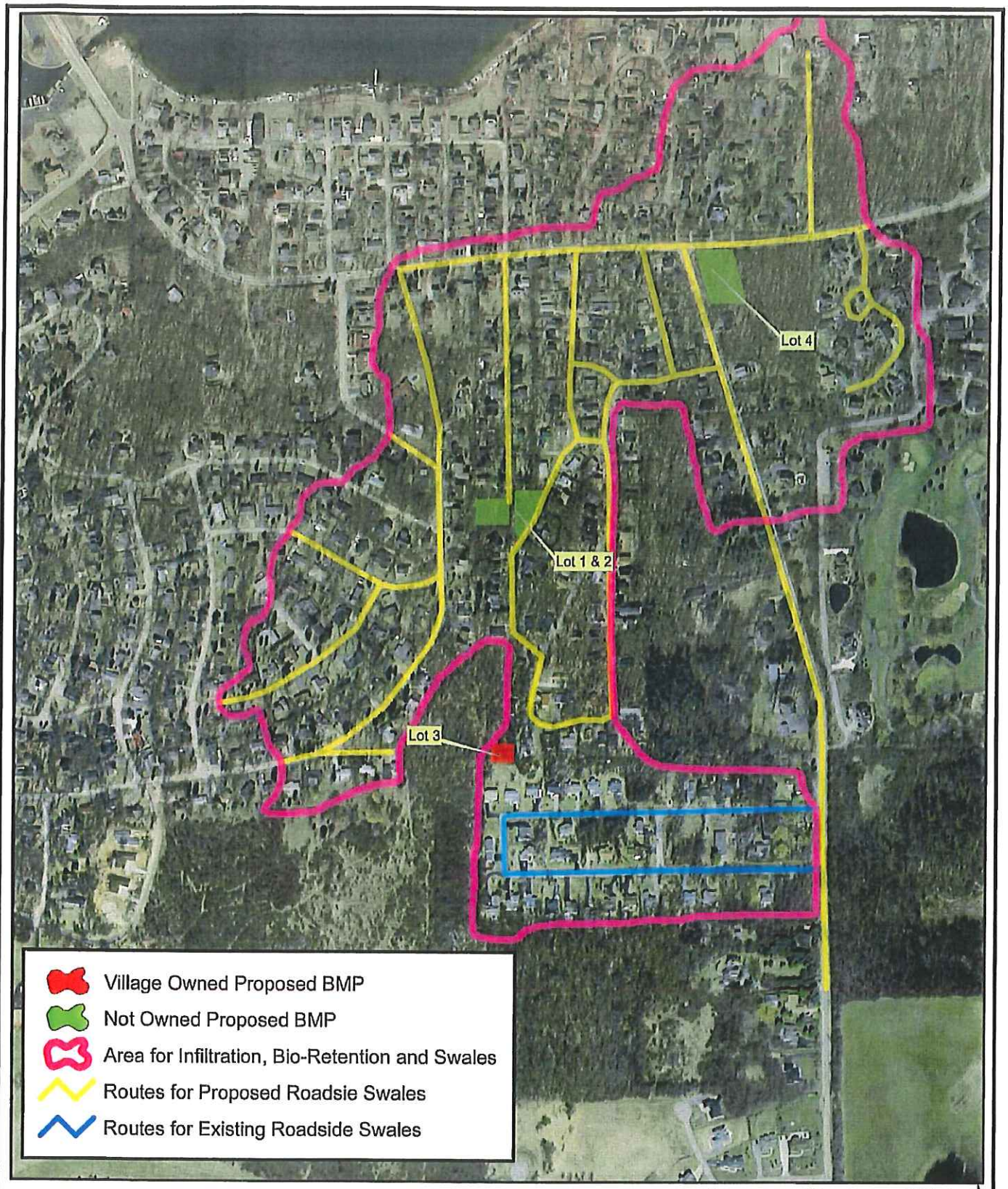
Figure
8



Source: Walworth County Information Systems Department
Projection: NAD 27 State Plane Wisconsin South

0 400 800 Feet
1:6,000
N

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Locations for Best Management Practices	Jan 08
Town of Fontana Storm Water Management Plan	Figure 9