II. STUDY AREA

The study area is depicted in Figure #1. The study area contains approximately 1,217 acres or 1.9 square miles of property located within the Town of Menasha and City of Menasha, Winnebago County, Wisconsin. Generally, the study area is bound to the west by Tayco Road and Racine Street (CTH 'P'), to the north by Midway Road (CTH 'AP'), to the east by Oneida Street and Home Avenue, and to the south by Plank Road (STH '114'). The study area includes 358 acres (29%) of property located in the Town of Menasha and 859 acres (71%) of property located in the City of Menasha.

The study area currently discharges to three outfalls. The three outfalls are tributary to Little Lake Butte des Morts and include the following: a 96-inch storm sewer located just north of the Tayco Pond site, an unnamed stream located just north of the Tayco Pond site, and the Lakeshore Drive ditch located just south of the Tayco Pond site. These three outfalls discharge stormwater into Little Lake Butte des Morts during both low-flow and high-flow conditions. The outfall locations are depicted in Figures #2 and #3.

The study area also discharges to three flow by-pass locations. The three flow by-passes are tributary to Lake Winnebago and include the following: a storm sewer / street surface by-pass located at the intersection of Baldwin Street and Plank Road (STH '114'), a street surface by-pass located at the intersection of Plank Road (STH '114') and Manitowoc Road, and a street surface by-pass located near the intersection of Elmwood Drive and 9th Street. The three flow by-pass locations are depicted in Figures #2 and #3.

III. HYDROLOGIC & HYDRAULIC ANALYSIS

A. Methodology

A hydrologic and hydraulic computer model was used to develop the rainfall / runoff relationship. The XP-SWMM2000 (V11.0) computer model was used for this study. The SWMM computer model was used to generate surface runoff hydrographs for each drainage area. The hydrographs include information such as peak flow rates, time of peak flow rates, and runoff volumes. The SWMM model was also used to combine, split, and hydraulically route hydrographs.

The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS or formerly SCS), Technical Release 55 methodology was also used to develop the rainfall / runoff relationship within the study area. The TR-55 methodology requires that various hydrologic parameters be input into the computer model. These hydrologic parameters generally include drainage area, percent imperviousness, runoff curve number, and time of concentration.

Table #8
Pre-Pond Construction & Existing Land Use Condition
Peak Water Surface Elevation

No.	Outfall (Node)	Location	Surface Elevation	Peak Water Surface Elevation		
				2-yr	10-yr	100-yr
1	P1a3-H	CTH 'P'	745.6	743.24	748.11	752.03
2	P1a3-G	Earl Street	756	746.50	752.17	757.03
3	P1a3-E	Appleton Road	761	750.05	754.41	757.85
4	P1a3-D	Ida Street	759	750.45	754.51	757.86
5	P1a3-C12	Melissa Street	758	750.76	754.54	757.83
6	P1a3-C10	Ninth Street	752	750.95	752.65	753.84
7	BX123-A	Plank Road	747.8	750.30	751.07	751.41
8	BX125	Baldwin Street	749.5	749.97	750.62	751.08
9	C1_C2	Konemac Street	752	750.55	752.43	752.61
10	P1a3-A	Elmwood Drive	749	751.14	752.15	752.60
11	P1a1/P1a2	Woodland Drive	759	752.99	760.12	760.47
12	P1a5-C2_E	Stream	743	740.48	743.49	743.83

The post-pond construction condition refers to hydraulic conditions after construction of Tayco Pond. Hydraulic results for the post-pond construction and current land use condition are provided in Appendix C and Table #9.

Table #9
Post-Pond Construction & Current Land Use Condition
Peak Water Surface Elevation

No.	Outfall (Node)	Location	Surface Elevation	Peak Water Surface Elevation		
				2-yr	10-yr	100-yr
1	P1a3-H	CTH 'P'	745.6	745.36	748.52	752.31
2	P1a3-G	Earl Street	756	748.02	752.40	757.12
3	P1a3-E	Appleton Road	761	750.64	754.50	757.88
4	P1a3-D	Ida Street	759	750.92	754.59	757.88
5	P1a3-C12	Melissa Street	758	751.10	754.61	757.85
6	P1a3-C10	Ninth Street	752	751.18	752.66	753.85
7	BX123-A	Plank Road	747.8	750.37	751.08	751.42
8	BX125	Baldwin Street	749.5	750.03	750.64	751.11
9	C1_C2	Konemac Street	752	750.55	752.43	752.61
10	P1a3-A	Elmwood Drive	749	751.29	752.16	752.60
11	P1a1/P1a2	Woodland Drive	759	753.24	760.12	760.47
12	P1a5-E	Stream	743	740.43	743.46	743.82

Tayco Pond has a 1,217 acre watershed and a permanent pool surface area of 3.02 acres. Performance of the Tayco wet detention pond is summarized below in Table #11. Also, a set of detailed construction plans for Tayco Pond is provided in Appendix A.

Table #11
Tayco Pond Summary

	SWMM (Node/Link)	Peak Outflow (cfs)	Storage Volume (ac-ft)	Normal Water Elevation (feet)	Peak Water Elevation (feet)
2-year	Pond_C2c / ss_out	353	11.8	738.50	742.00
10-year	Pond_C2c / ss_out	436	16.4	738.50	743.24
100-year	Pond_C2c / ss_out & overfl	526	23.6	738.50	745.09

In summary, Tayco Pond increases the elevation and duration of surface water flooding within upslope storm sewers. The flood elevation increases vary by location and storm event. As previously discussed, flow by-passes are also occurring at Baldwin Street and Elmwood Drive (see Figures 2 and 3 for flow by-pass locations) during the 2-year, 24-hour design storm. The flow by-passes at Baldwin Street and Elmwood Drive are occurring during both the pre-pond construction condition and post-pond construction condition. During the 10-year and 100-year storms, flow by-passes are occurring at Baldwin Street, Plank Road and Elmwood Drive. Due to the increases in surface water flooding and flow by-passes, McMahon recommends that additional flood storage be evaluated for the Tayco Pond Watershed. It may be feasible to strategically locate one flood storage facility in the watershed to reduce current flooding and flow by-pass problems.

IV. WATER QUALITY ANALYSIS

The NR 151 stormwater regulations require 80 percent total suspended solids (TSS) removal for new development and 40 percent removal for re-development as compared to no water quality controls. According to NR 151, the TSS reduction must be achieved prior to discharge into waters of the state (i.e. wetlands, lakes, rivers, navigable streams, etc.). As previously discussed, the study area discharges into the 96-inch storm sewer located north of Tayco Pond prior to discharge into Little Lake Butte des Morts.

A. Methodology

The water quality analysis for the study area was prepared using the Source Loading and Management Model (SLAMM v9.3.0). SLAMM is an urban water quality model that predicts runoff volumes and non-point source pollution within a watershed. SLAMM calculates mass balances for both particulate and filterable

Table #12. The water quality impacts associated with the two flow by-pass locations are also summarized in Table #12 and within Appendix D. After considering the two flow by-passes, the removal rate provided by Tayco Pond is 52.1 percent or 171,392 pounds of TSS.

Table #12
Total Suspended Solids (TSS)
Reduction Provided

Location & Flow By-Pass Condition	Drainage Area (acres)	TSS Inflow (lbs.)	TSS By-Pass (lbs.)	TSS Removed (lbs.)	TSS Outflow (lbs.)	Removal Rate (%)
Before Evaluating Flow By-Passes						
Tayco Pond	1,217	328,926	-	172,356	156,570	52.4
After Evaluating Flow By-Passes						
Baldwin Street (P1a3-C1 & C2)	46.2	-	1,274	-	-	-
Elmwood Drive (P1a3-A)	115.9	-	567	-	-	-
Tayco Pond	1,217	327,085	1,841	171,392*	155,693	52.1**

* TSS removed was determined by multiplying 327,085 lbs by 52.4%.

** TSS removal rate (%) for the Tayco Pond Watershed was determined by dividing 171,392 lbs and 328,926 lbs.

The total phosphorus (TP) reduction provided by Tayco Pond for the post-pond construction watershed and future land use condition is summarized in Table #13. The water quality impacts associated with the two flow by-pass locations are also summarized in Table #13 and within Appendix D. After considering the two flow by-passes, the removal rate provided by Tayco Pond is 37.2 percent or 380.3 pounds of TP.

Table #13
Total Phosphorus (TP)
Reduction Provided

Location & Flow By-Pass Condition	Drainage Area (acres)	TP Inflow (lbs.)	TP By-Pass (lbs.)	TP Removed (lbs.)	TP Outflow (lbs.)	Removal Rate (%)
Before Evaluating Flow By-Passes						
Tayco Pond	1,217	1,021.0	-	383.2	637.8	37.5
After Evaluating Flow By-Passes						
Baldwin Street (P1a3-C1 & C2)	46.2	-	4.2	-	-	-
Elmwood Drive (P1a3-A)	115.9	-	3.3	-	-	-
Tayco Pond	1,217	1,013.5	7.5	380.3*	633.2	37.2**

* TP removed was determined by multiplying 1,013.5 lbs by 37.5%.

** TP removal rate (%) for the Tayco Pond Watershed was determined by dividing 380.3 lbs and 1,021.0 lbs.

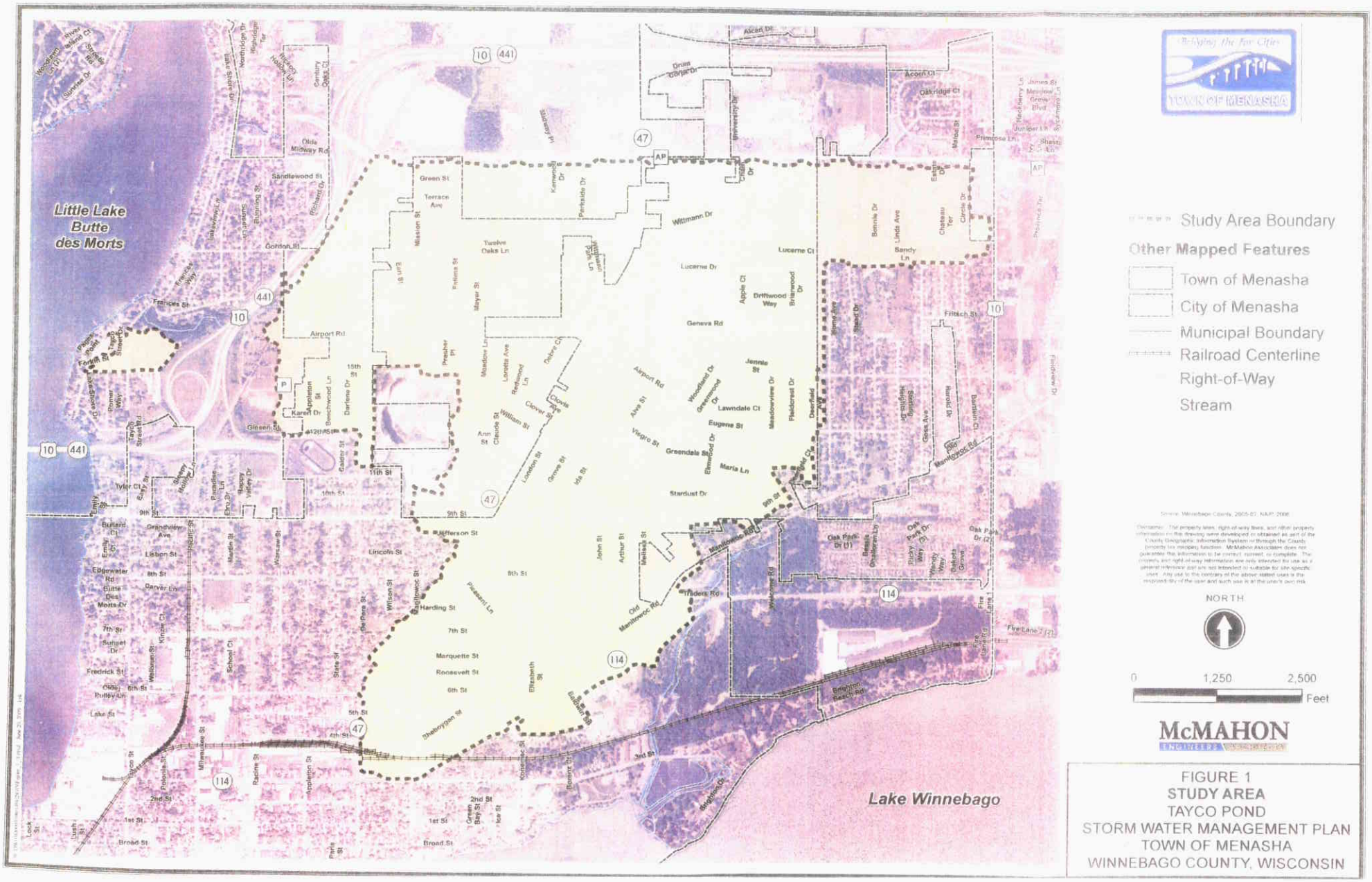
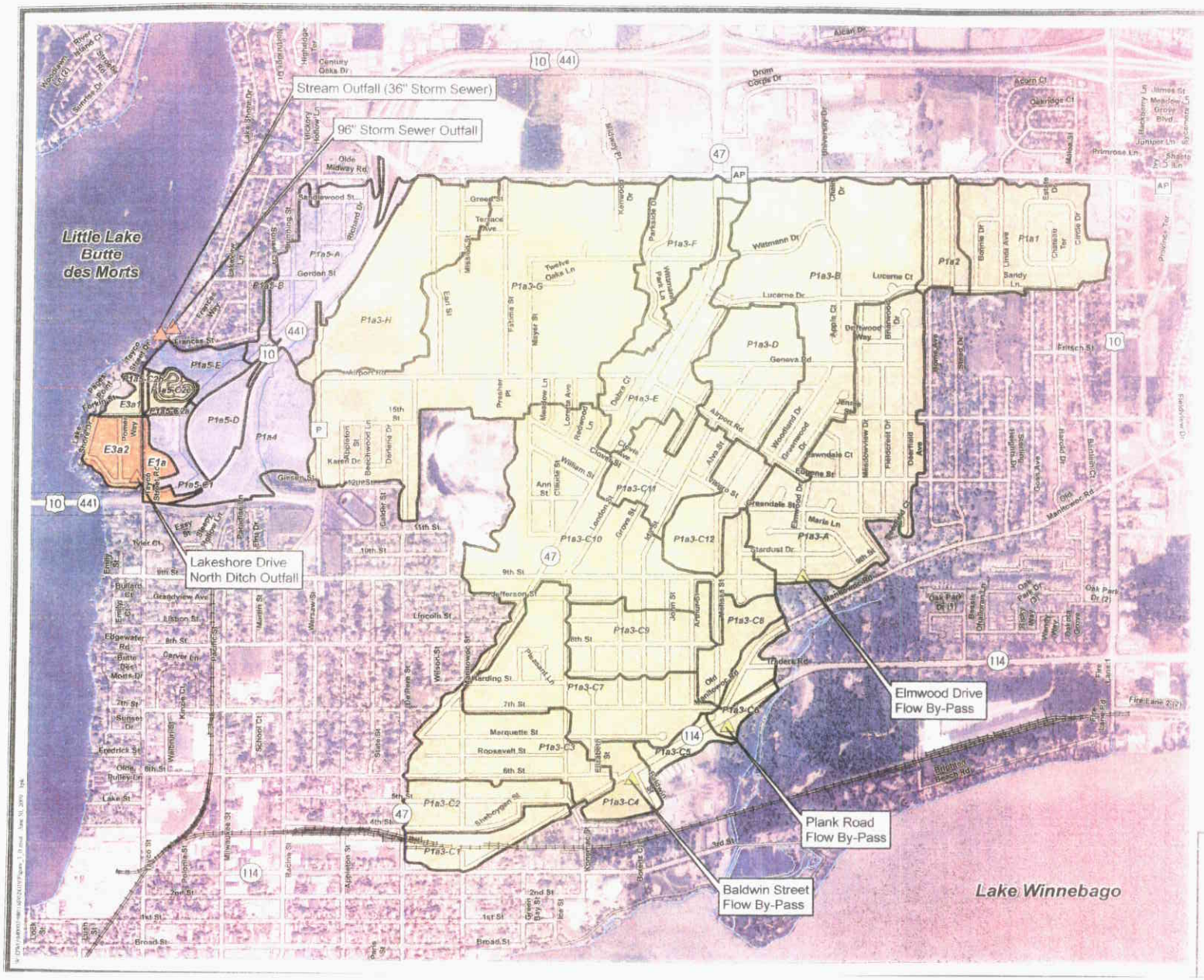


FIGURE 1
STUDY AREA
TAYCO POND
STORM WATER MANAGEMENT PLAN
TOWN OF MENASHA
WINNEBAGO COUNTY, WISCONSIN



Bridging the Fox Cities
TOWN OF MENASHA

Mapped Features

- Outfall
- Flow By-Pass
- Railroad Centerline
- Right-of-Way
- Stream
- Tayco Pond Watershed
- Stream Watershed
- Currently Discharges to Lakeshore Drive
- P1a1 Drainage Area and ID

Source: Winnebago County 2005 GIS, NAIP 2008

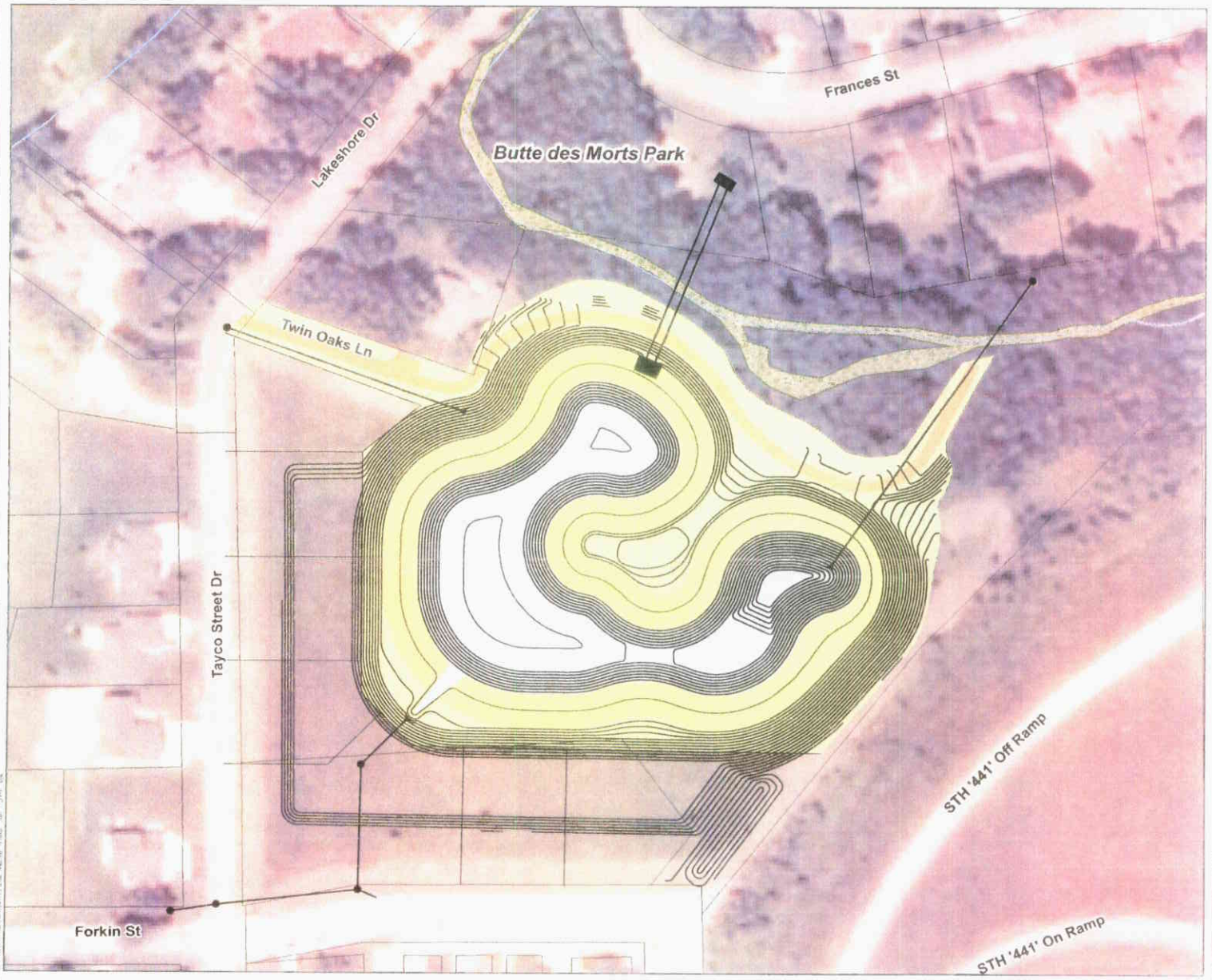
Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMahon Associates does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended as suitable for site specific use. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

NORTH

0 1,250 2,500
Feet

McMAHON
ENGINEERS WORKDESIGN

FIGURE 3
POST-POND CONSTRUCTION WATERSHED
TAYCO POND
STORM WATER MANAGEMENT PLAN
TOWN OF MENASHA
WINNEBAGO COUNTY, WISCONSIN



Bridging the Two Cities
TOWN OF MENASHA

Mapped Features

- Parcel Line
- Proposed Pond Contour
- Proposed Storm Sewer
- Stream
- Deep Water (15 Feet)
- Safety Shelf/Wetlands
- Prairie Plantings
- Maintenance Trail (12 Feet)
- Natural Wetland

Source: Winnebago County, 2005-07, NAD 1983

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMahon Associates does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site specific uses. Any use or the accuracy of the above stated uses is the responsibility of the user and such use is at the user's own risk.

NORTH

0 100 200 Feet

McMAHON
ENGINEERS ARCHITECTS

FIGURE A
TAYCO POND
TOWN OF MENASHA
WINNEBAGO COUNTY, WISCONSIN