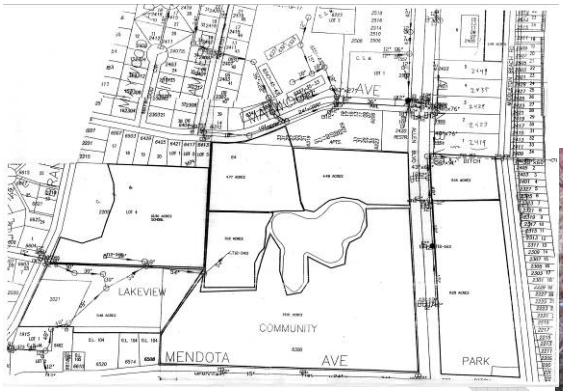
FEASIBILITY REPORT

City of Middleton
Lakeview Park Water Management Plan/Wetland Restoration



Prepared by: Nahn and Associates L.L.C.

Date: April 23, 2008

TABLE OF CONTENTS

Chapters

Figures

Tables

TABLE OF CONTENTS (Continued)

Tables (cont)

Appendix

I. Executive Summary

Lakeview Park is a sixty acre park in the southeast portion of Middleton with mixed pond water/stormwater/spring flow flowing through it in a ditch to Lake Mendota (Lake). The purpose of this report is to evaluate several water management alternatives to reduce the pollutant loading into the Lake including nutrients (nitrogen and phosphorus), heavy metals, oil and grease, suspended sediment and other pollutants. The City of Middleton is under a mandate from the WDNR to improve stormwater quality entering the Lake from two permits-the WPDES permit for Tiedeman's Pond pumped discharge and the city-wide municipal storm water permit.

Diverting water to several areas adjacent to the ditch will improve water quality, restore wetlands by re-watering and provide fish rearing and habitat opportunities including:

- Area B,C (7.25 acres)- degraded wetlands north of the Park West ditch, west of Allen Blvd. and east of Sauk Trails School soccer field,
- Area D (9.25 acres) - degraded wetland east of Allen Boulevard, south of the Park East Ditch, south of the active park area, and north of Mendota Drive and
- Area F (4.7 acres)- combined upland/wetlands area north of the Park East ditch, east of Allen Boulevard, west of Middleton Beach Road and south of the Century Square Shopping Center. (This area was formally owned by Jacobsen and commonly referred to as the Jacobsen Parcel.)

Based on an analysis of soils, wetlands, groundwater levels and elevations, diversion of water to:

- Area D was the most feasible,
- Area F was moderately feasible with additional earth movement cost and
- Area B,C was least feasible.

The WDNR was consulted to determine if the diversion is allowable and will require pre-treatment of water prior to entering the wetlands in Area D and F. A variety of different funding sources exist to finance the construction of this diversion including the WDNR wetland incentive grant, Lake Protection grant and the Dane County Urban Water Quality Grant.

II. Introduction and Background

Lakeview Park (Park) is a sixty acre City of Middleton Park just west of Lake Mendota on either side of Allen Boulevard, north of Mendota Avenue, east of Branch Street and south of Century Avenue. Thirty-nine of the sixty acres are zoned conservancy with the balance for recreational use. For the purposes of this report, the Park can be divided into two sections:

- Park East refers to the portion of the park east of Allen Boulevard and
- Park West refers to the portion of the park west of Allen Boulevard.

Stormwater from a predominately urban residential 169 acre watershed drains into Park West through a 54-inch storm sewer pipe. Stormwater from the pipe outfall flows eastward in the Lakeview Park Ditch (Ditch) for approximately 1400 feet through Park West and Park East before discharging directly into the Lake east of Middleton Beach Road. Pictures of various creek cross-sections are shown in Figures 1-8. The stormwater conveyance system including the pipe and ditch is shown in Figure 9.

The purpose of this report is to evaluate several water management alternatives to reduce the pollutant loading into the lake including nutrients (nitrogen and phosphorus), heavy metals, oil and grease, suspended sediment and other pollutants and restore wetlands. Residents living near the Lake on Middleton Beach Road have observed a "green plume" of water entering the clear water of the lake 24 hours after a storm event from this ditch. A large sediment delta has also built up at the Lake outfall as shown in Figures 10-11.

Actively eroding creek banks along both sides of the Ditch in both Park East and Park West also contributes to the sediment load into the Lake as shown in Figures 1-8. Many of these bank slopes are quite steep (1H:1V or steeper) with no vegetation to provide erosion protection. Sections of the ditch with observed actively eroding creek banks are shown in Figure 12.

Flood control improvements are not analyzed as part of this report, the recommended improvements are based on water quality/wetland restoration benefits only. However, the improvements will provide some ancillary flood control benefits. The majority of the flooding problems to homes in this area are related to the high lake level and not inadequate ditch capacity .

The history of the development in this area is contained in a report titled "Lakeview Park Conservancy Areas Middleton, Wisconsin- Ecological Assessment and Restoration Plan" in October 2002, by Robert Wernerehl of Clark Forestry (Wernerehl report). The Wernerehl report describes many improvements also contained in this report from an ecological, soils and vegetative perspective. A 1906 USGS map is shown in Figure 13 demonstrating that this entire area was once a large peat-soil based wetland. The existence of this wetland is confirmed by earlier pictures of the area west of Allen Boulevard, prior to the development of the Middleton Springs Shopping Center shown in Figures 14-15. As this area became developed, the peat soil was covered with several feet of clay fill.

This report focuses on water management/wetland restoration opportunities in three separate areas adjacent to the Ditch. For simplicity these areas are labeled the same as the earlier Wernerehl report as shown in Figure 16 including:

- Area B, C (7.25 acres)-wetland north of the Park West ditch, west of Allen Blvd. and east of Sauk Trails School soccer field,
- Area D (9.25 acres)-degraded wetland east of Allen Boulevard, south of the Park East Ditch, south of the active park area, and north of Mendota Drive and
- Area F (4.7 acres)- combined upland/wetlands north of the Park East ditch, east of Allen Boulevard, west of Middleton Beach Road and south of the Century Square Shopping Center. (This area was formally owned by Jacobsen and commonly referred to as the Jacobsen Parcel)

Figure 1- Park East Ditch Crossing at MBR

Figure 2- Park East Ditch-Upstream of MBR

Figure 3- Park East Ditch-midway betw MBR & Allen

Figure 4- Park West Ditch-Upstream of Allen Blvd

Figure 5-Park West Ditch at Ped Bridge Crossing

Figure 6- Park West Ditch-U/S of Ped Bridge

Figure 7- Park West Ditch- Downstream of Bend

Figure 8- 54 inch Pipe Outfall at Park West

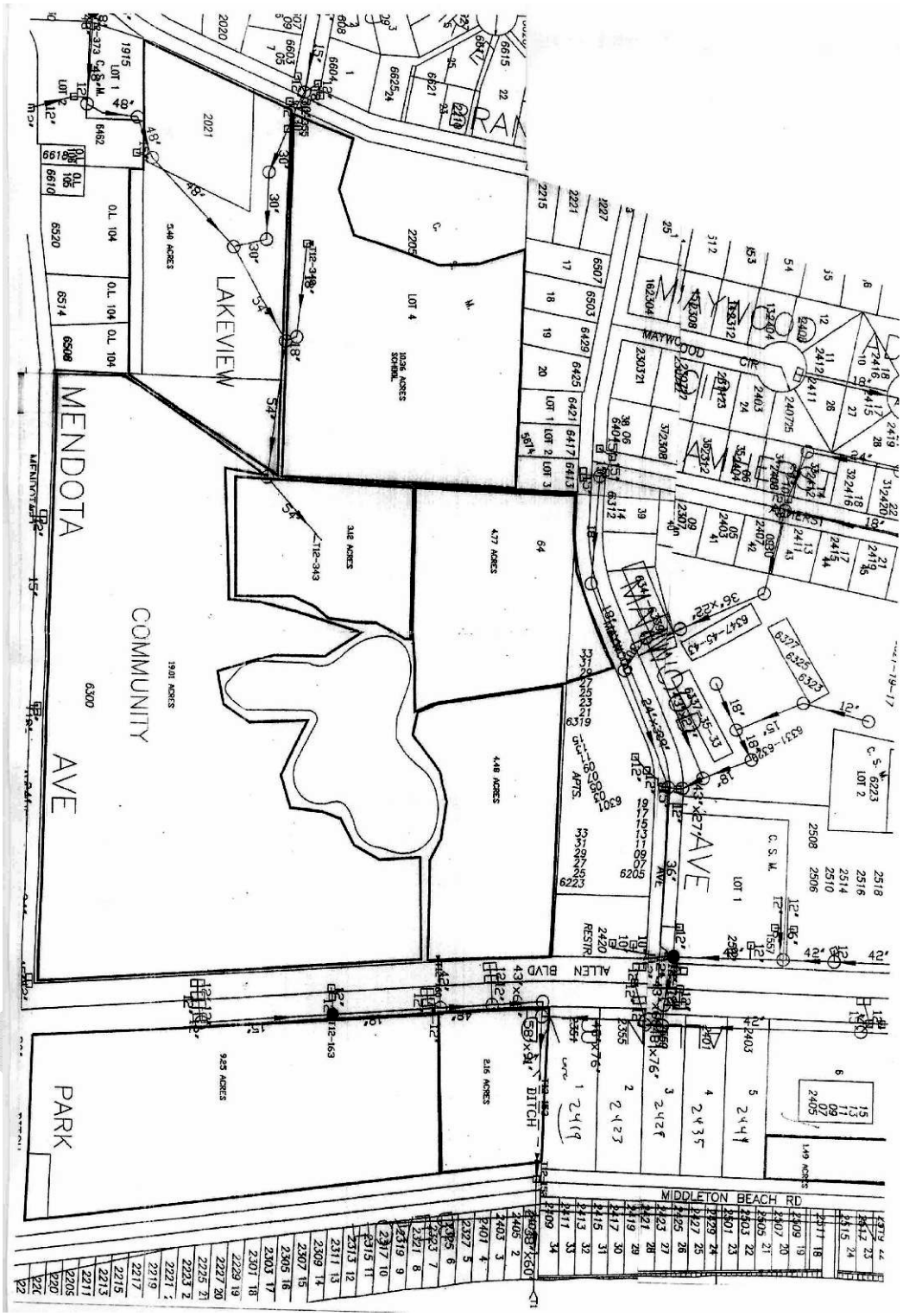


Figure 9- Lakeview Park Ditch

Figure 10- Sediment Delta in Lake

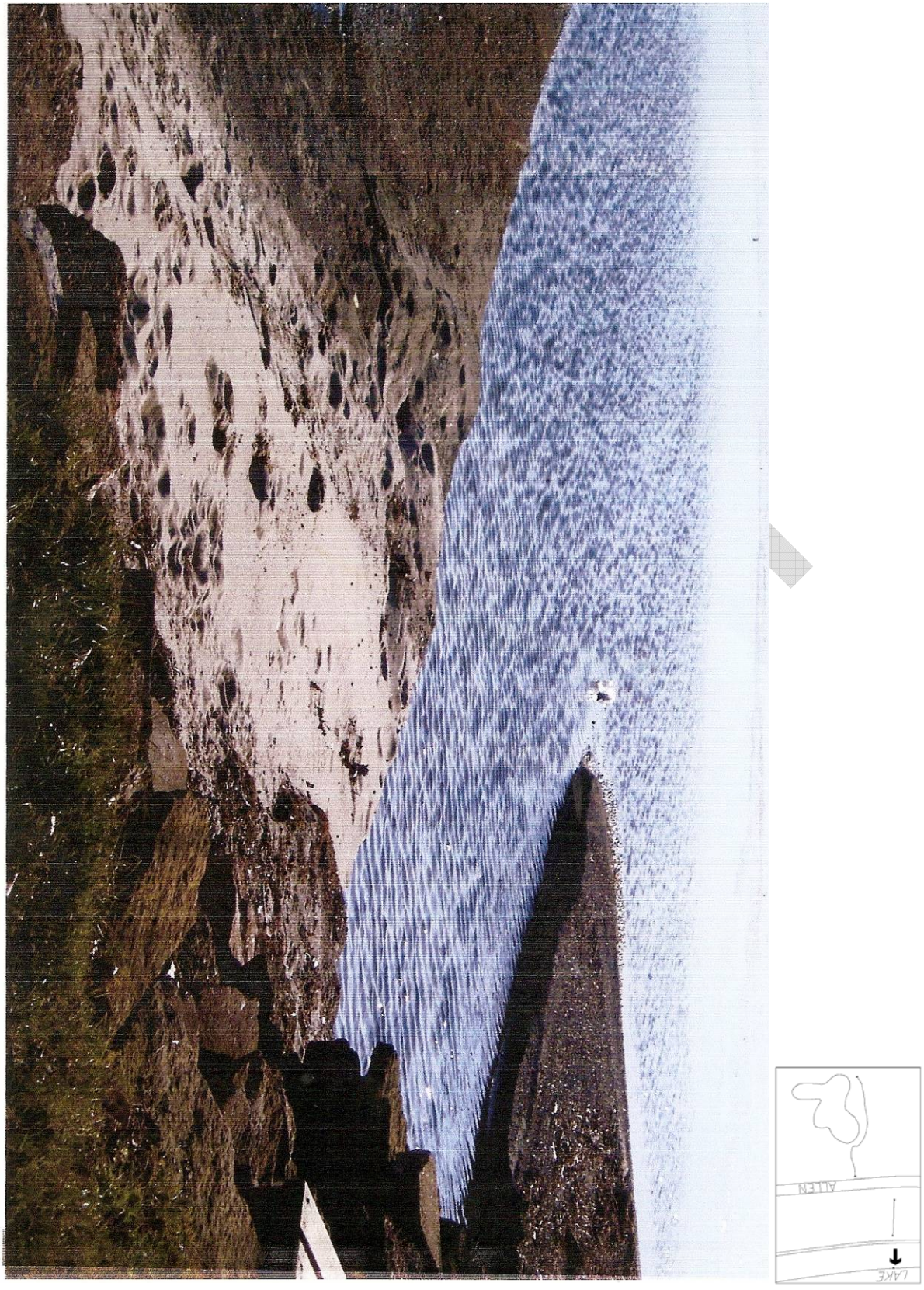


Figure 11- Sediment Delta in Lake

Lakeview Park in 1906 N

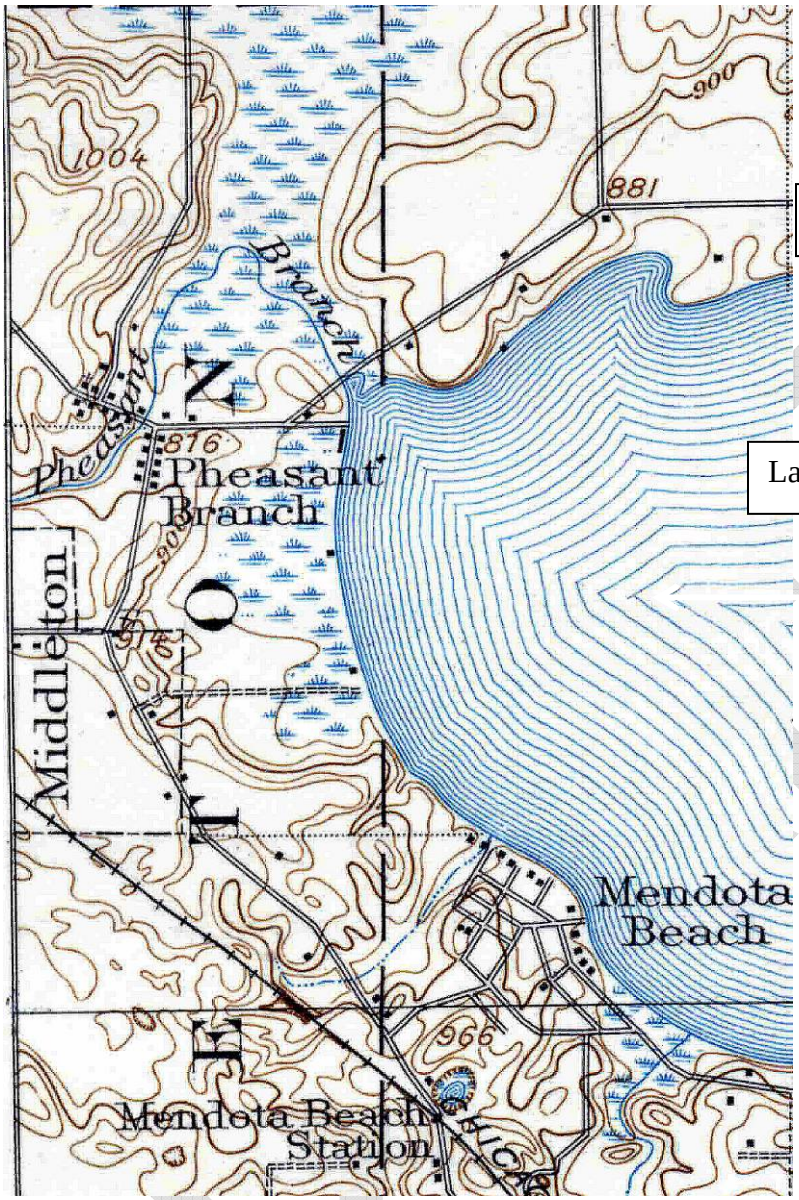


Figure 13- 1906 USGS Map of Middleton

This is a U.S.G.S. topographic map from 1906. It shows that a settlement called Pheasant Branch was as big as Middleton. The entire area where Lakeview Park is today was open marsh. Middleton Beach Road did not exist, but there were a couple of building right on the shore. (Figure copied from Wenerehl report with permission from author.)

Figure 14- Picture of Mendota circa 1957
(note Allen Boulevard in Background)

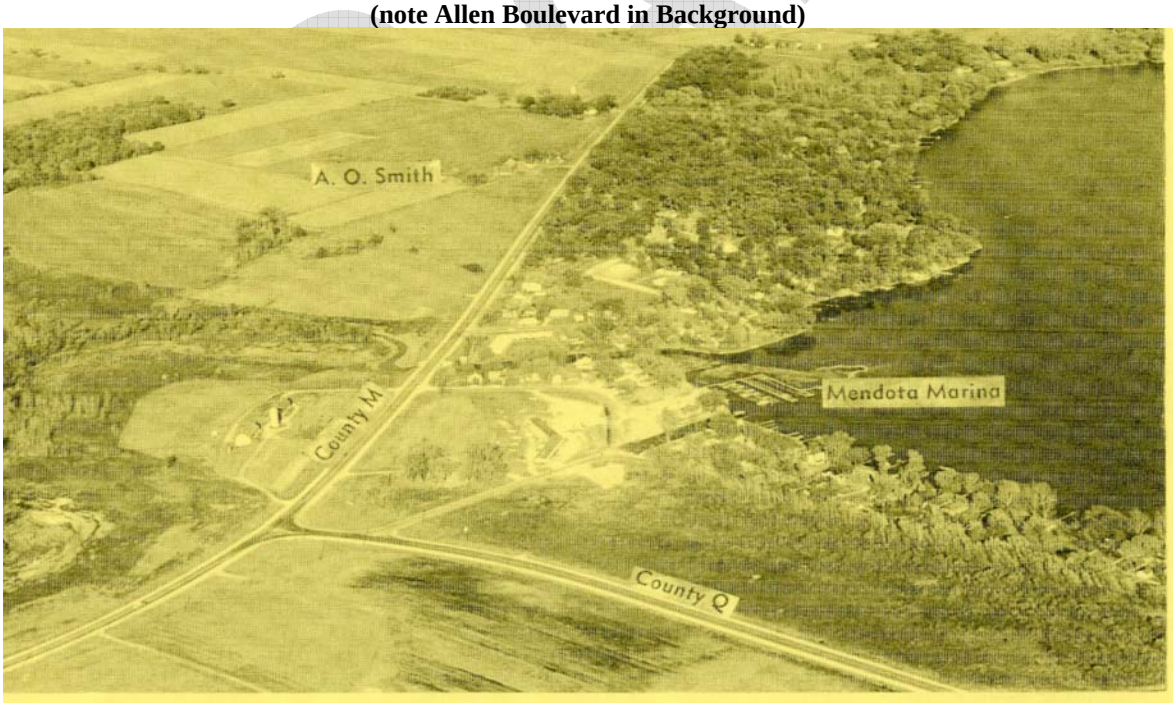


Figure 15- Picture of Mendota circa 1957
(Note vacant lands behind CTH 'Q')

This report meets the goals and objectives of the City of Middleton Conservancy Lands Plan 2005-2009 (Schreiber/Anderson, page 5, 6) as follows:

"Goals

- **Protect and restore designated conservancy lands to maintain or improve the natural habitat, scenic beauty passive recreation and environmental outdoor education,**
- **Improve water quality within the conservancy land properties,**
- **Restore natural vegetative communities within the City, including but not limited to uplands, lowland forests wetland/sedge meadow and oak savanna areas.**

Objectives

- **Plan and implement programs designed to restore and develop Middleton's conservancy lands so as to provide aesthetic landscapes as well as opportunities for education and passive education for all.**
- **Maintain or improve the water quality of all lakes, creeks and kettle ponds within Middleton's conservancy lands system by providing a shoreland buffer zone of diverse native vegetation 100' to 300' in width along the edges of streams, wetlands and ponds.**
- **Protect and enhance the existing native flora and fauna within the conservancy lands."**

This report also meets the City of Middleton Comprehensive Park and Open Space Plan, 2007-2012 (November 27, 2007 plan by Mayo Corporation) Mission Statement (page 1):

> **".. the City of Middleton seeks to provide a park and recreation system that will meet the needs of current residents and future residents; preserve and protect the City's open space, water and cultural and natural resources…"**

A survey of 12 creek cross-sections was performed to determine the channel capacity and velocities. These cross sections data are shown in Appendix 1 with the ditch profile and typical cross-sections shown in Figures 17-20.

Figure 17 - Ditch Invert Profile

Figure 18- Typical Ditch Cross Sections

Figure 19- Typical Ditch Cross Section

Figure 20- Typical Ditch Cross Section

III. Site Hydrology

The site hydrology is a combination of stormwater runoff, Lakeview Park Pond discharge and intermittent discharge from the Tiedeman's Pond pumped discharge through the Park Street force main sewer system as described below:

III-a. Stormwater Runoff

Stormwater runoff for the drainage area was divided into two sub-watersheds:

- Park West ditch watershed is 169 acres with 17% commercial, 20% open space, 6% institutional and 53% low density residential land use.
- The Park East ditch watershed is 227.6 acres and includes the drainage system along Maywood Avenue (25% low density residential, 15% commercial and 60% high-density residential land use) and North Allen Blvd (80% commercial and 20% urban highway land use).

Both of these watersheds are completely developed with the only open space consisting of the Park and Sauk Trails School property.

The 2-year, 10-year and 100-year runoff rates were determined using the HydroCad computer model which utilizes the NRCS (formally SCS) Tr-55 methodology. The results are shown in Table 1.

Table 1 Summary of Ditch Hydrology

Watershed	2-year flow rate (cfs)	10-year flow rate (cfs)	100-year flow rate (cfs)
Park West	**121**	**242**	**439**
Park East	**164**	**320**	**565**

III-b. Lakeview Park Pond Discharge

The Lakeview Park Pond is located in Park West and constantly discharges into the Lakeview West Ditch via a vertical overflow pipe. This pond is approximately 6 feet deep and is spring fed.

III-c. Tiedeman Pond Pumped Discharge-

Tiedeman Pond is a kettle pond (pond with no discharge) located southwest of the Park. In 2000, highwater in Tiedeman Pond was threatening to flood several adjacent houses. The city constructed a permanent pumping station to pump high water from Tiedeman's into a force main pipe on Park Street and eventually into the Park West drainage ditch. Since 2000, this pump has operated intermittently whenever the level of Tiedeman's Pond exceeds a certain level. The pump is calibrated to discharge at 900 gallons per minute rate (1.3 million gallon per day).

Table 2 lists the range of pumping rates and days of operation for the pump from 2003-2005.

Table 2 Tiedeman Pond Pumping Results- 2003-2005

Year	Days Pump Operated	Minimum Daily Pump rate (MGD)	Maximum Daily Pump Rate (MGD)
2003	**50**	**0.008**	**3.94**
2004	**58**	**.05**	**5.22**
2005	**31**	**.09**	**4.07**

The WDNR has issued a WPDES permit to discharge water into Lake Mendota with discharge, phosphorus, total suspended sediment (TSS) and Total Nitrogen- Ammonia (NH_3-N) limits. During some pumping intervals, the TSS limit of 30 mg/l has been exceeded resulting in a permit violation.

IV. Site Water Management Alternatives

The Park West and Park East Ditch can be diverted to three areas (as described above) to provide water treatment and wetland restoration. Two of these three areas were identified as possible water diversion areas in the Wernerehl report. A description of the site conditions for each of these areas are:

Area B,C- Water diversion/wetland restoration to an area north of the Park West ditch, west of Allen Blvd. and east of Sauk Trails School soccer field- This area consists of low-lying lands north of the pond. The underlying soil is classified as "Houghton Muck" which is a peat based soil which has become dried out and partially oxidized making it very soft. Approximately 115,000 square feet of land exist for water treatment/wetland restoration.

Area D - Water diversion/ wetland restoration into the existing degraded wetland in Park East south of the active park area- This area is a dried-up wetland with several open wetland areas near Middleton Beach Road. The soils are Houghton Muck and similar to Area B,C. The precise location of the wetland has not been determined. The depth to groundwater is also unknown in this area. 160,000 square feet of land is available for water treatment/wetland restoration in this area.

Area F - Water diversion/wetland restoration along the Park East ditch west of Middleton Beach Road. With the recent purchase of the Jacobsen parcel, the stormwater from the Maywood and Allen North system could be diverted into this area. A field wetland delineation reveals wetlands to the east and uplands in the west 60 feet near Allen Boulevard.

IV- a. Diversion of Water to Wetland

The basic intent of water diversion into all three of these areas is to restore wetlands. The Wisconsin Wetlands Association defines wetland restoration as:

> **"Wetland restoration is defined as the reestablishment of wetland conditions similar to the original condition in an area where wetlands were altered by past human activities. Many of the state's former wetlands are significantly disturbed and have been altered by such activities as ditching, drain tile installation, stream channelization, and sedimentation. These areas generally have hydric soils typical of wetlands, and may have some wetland plants growing among weeds or crops. The key to wetland restoration of these sites is reestablishing the area's original hydrology and topography, and restoring natural processes including the original native plant cover."**

This scenario is clearly what has historically occurred in these wetland areas. Remnants of the high-quality wetlands that once existed can still be found in isolated pockets. For example, isolated pockets of somewhat-rare wetland species Fen Thistle and Sweet Indian Plaintain can still be seen in Area D. For a more detailed description of the past and current condition of these wetlands, please reference the Wenerehl report.

Since all three of these areas involve diverting a portion of the water to delineated wetlands, the WDNR was consulted to determine if water diversion is a potential water quality use for these wetlands. The WDNR Permit Coordinator indicated that any discharge to a wetland must meet the water quality uses, criteria and standards in NR 103.

NR 103.03 does identify the following water quality uses of a wetland for:

> **(a)** "**Storm and floodwater storage and retention and**
> **(b) Filtration or storage of sediments, nutrients or toxic substances that would otherwise adversely affect the quality of other waters of the state.**"(such as Lake Mendota).

NR 103.03 (b) describes the criteria used to

> "**assure the maintenance or enhancement of a functional value of a wetland including no adverse impact to the wetland from any liquid , fill or solids, floating or submerged debris, materials producing color, odor, taste and unsightliness, toxic materia**l".

Functional assessments of all three wetlands are needed, prior to diverting water into them, to demonstrate that the diversion will have no adverse impact. If these materials are present in the water and are determined to cause an adverse impact to the wetlands than a water treatment device may be required upstream of the wetland to mitigate the adverse wetland impact.

A field review meeting with the WDNR was held on September 7, 2007 and a follow-up meeting on November 28, 2007 to determine the preliminary wetland functionality assessment and adverse impact determination. Based on the WDNR input during these meetings:

- Discharge to Area F requires pre-treatment prior to discharge.
- Direct discharge to Area D is possible since pre-treatment is already provided on the west side of Allen Boulevard.
- Discharge to Areas B,C is more difficult because the delineated wetlands line the channel on both sides and no pre-treatment area is present.
- The banks of the Ditch can be lowered to allow high flows to enter the wetlands in Area B,C.
- All three wetland areas can be sculpted to provide varying elevations as long as no fill is placed in the wetland from outside sources.

IV- b. Soils

The soils in all three areas are classified as "Houghton Muck" which is a peat based soil. These peat soils exist at all three wetland locations at varying depths. As noted above, these peat soils existed in a "wet" condition when the entire area of Middleton was a wetland in 1906 prior to development. Since development has occurred, these peat soils have dried out and the health of these wetlands is threatened with invasive species and top heavy trees rooted in unstable soft soils. To restore the wetlands, as noted in the Wernerehl report (page 9):

> **"The primary consideration is to re-wet the dry peat soils by capturing and retaining runoff now flowing past these areas. This would serve a secondary purpose of cleansing, buffering and filtering the stormwater runoff before it enters Lake Mendota."**

Diversion of the Park West and Park East water into these wetlands represents a "win-win" situation. The wetlands benefit by re-wetting the dried peat and the Lake benefits by filtering pollutants prior to discharge.

Filtering the water through the peat based soils provides excellent water quality treatment. When constructing wetlands for water treatment, peat soils are routinely used as the soil media based on their pollutant removal capabilities.

IV- c. Elevation

The Ditch elevations must allow the water to gravity flow to the treatment areas to eliminate costly pumping. The surveyed elevations of the ditch were compared to the ground elevations of these areas to determine the depth of the soil that should be removed to allow gravity flow.

IV-d. Pretreatment Area

Depending on the wetland type and functionality, pretreatment of the water may be needed prior to diversion into the wetland. As noted above, Area D already has pre-treatment and space is available for pre-treatment in Area F. Area B,C does not have available space for pretreatment since wetlands line both sides of the Ditch. To determine the approximate efficiency of the pre-treatment area, Table 2 in the Wet Detention Basin Technical Standard was used (Standard #1001) which lists the approximate area needed to remove 80% of the Total Solid Suspended load based on drainage area size and land use. This table is provided in Appendix 2.

IV-e.- Groundwater Level-

The seasonal high groundwater level should be low enough to allow filtration through the peat soils. A groundwater level near the ground surface will not permit adequate soil-contact and reduce the pollutant removal capability.

IV-f. Site Analysis

Each site was analyzed based on the feasibility of the soils, elevation, wetland condition, pretreatment area and groundwater level (as described above). The soil borings, wetland boundaries and ground elevations for these three areas are shown in Appendix 3-5and summarized as follows (please note all elevations are referenced to 1929 NGVD Datum):

AREA B,C- (Appendix 3 contains site data)

- **Elevation**- The bottom elevation of the Ditch in Areas B,C was surveyed to be around 857 ft near the pedestrian bridge crossing while the ground elevation of the wetland ranges from 863 to 859. Assuming a 3 foot-deep basin for pretreatment, diversion of the water requires a 2- to 6- foot cut for gravity flow.
- **Soils**-Representative borings show a 2 to 6 foot cut is into peat/clay soils which are underlain by a 4-foot layer of clay. The clay underlayment will limit the effectiveness of the peat soils for water quality purposes.

- **Wetlands/Pretreatment**-The WDNR also has expressed concerns (listed above) regarding the lack of pre-treatment in this area since wetlands line both sides of the Ditch.
- **Groundwater Level**- The groundwater level will be at the ground surface once the 2-6 cut is made for gravity flow.

AREA D- (Appendix 4 contains site data)

- **Elevation**-The elevation of the storm sewer pipe that crosses Allen Boulevard is at 854 ft based on field survey conducted as a part of this project and plan drawings obtained from the City. The wetland elevation ranges from 857 feet along Allen Boulevard to 851 feet along Middleton Beach Road. A 0-3 foot cut is required.
- **Soils**- The borings indicate that three feet of gray/brown lean clay is at the surface underlain by a combination of peat and sand layers. Please note that these borings are for the active park area to the north of Area D. Obtaining soil borings within Area D is recommended to verify the information in the borings listed in Appendix 3.
- **Wetlands/Pretreatment**- As indicated above, the wetland is drying up due to a lack of water. Historically, a ditch extended along the north side of Area D which brought water to the wetland. However, this ditch was abandoned in 1970, when a storm sewer was installed on the east side of Allen Boulevard. Pre-treatment is provided on the west side of Allen Boulevard within a sediment basin installed by the City in 2002. The amount of pre-treatment provided by this basin is unknown due to the unknown surface area. However, less than 60% treatment is probable given the large drainage area and small detention area. Using the Table in Appendix 2, a 1.7 acre surface area is needed for 80% removal and a .75 acre basin is needed for 50% removal.
- **Groundwater**- The groundwater level is 4 feet below the proposed ground surface which should provide sufficient filtering depth.

AREA F (Appendix 5 contains site data)

- **Elevation**-The elevation of the storm water pipe on the east side of Allen Boulevard is at 853 elevation and the upland elevation ranges from 856 (west) to the wetland elevation of 850 (east). Assuming a 3-foot deep pre-treatment basin, a 2- 8 foot cut is needed to achieve gravity flow conditions.
- **Soils**-The only soil information for Area F is the recent wetland delineation report showing peat soils down to 5-6 feet without underlaying clay soils. However, deeper borings south of Area F on the north side of the active park show a clay layer 6 feet below the ground surface. Obtaining soil borings within Area F is recommended to verify the borings listed in Appendix 5.
- **Pretreament/Wetlands**- As noted above, this area does have a 60 foot upland area immediately adjacent to the wetlands (along the east side of Allen Boulevard). Using the Table in Appendix 2 for a 58.6 drainage area, .7 acres will remove 80% of the Total Suspended Solids. A .9 acre area is available (50 ft by 500 ft) so 80% treatment is feasible.
- **Groundwater**- The groundwater level is between 849 and 850 feet based on the borings obtained from the active park to the south and the probes collected during the wetland delineation. Since the wetland elevation is proposed to be 850, the filtering depth is 0-1 feet .

These site conditions for the three areas are summarized in Table 3 below.

Table 3- Lakeview Park Wetland Restoration/Water Treatment Areas

Area	Cut to Flow (Ft)	Groundwater Level	Soils	Pre-treatment Space	Pretreat % removal
BC	2-6	High	Clay	No	-------
D	0-3	Low	Peat*	Yes	<60
F	2-7	High	Peat*	Yes	80

Due to the configuration of the existing stormwater conveyance system, stormwater from the Park West watershed could be more easily diverted into Area B,C and/or D and the Maywood and Allen –North system diverted to Area F.

V. Recommendations

Based on these analysis above, water diversion/wetland restoration is feasible at:

AREA B,C- Diversion of lower flows is not feasible due to the large amount of earth movement, clay soils, lack of pre-treatment space, and high groundwater. However, diversion of higher flows is feasible since the earth movement costs, clay soils and high groundwater concerns are mitigated. This alternative will replenish water to the wetland on a seasonal basis and also provide flood control benefits.

AREA D-Diversion of water is feasible based on the peat soils, minimal earth movement, low groundwater level and pre-treatment space already in-place. Two options exist for diverting the water to Area D. The first option is to cut 3 feet and divert the water into the wetland along the east side of Allen Boulevard The second option is to leave the higher area along Allen Boulevard intact and divert the water to match the grade of the existing wetland 200 feet east of Allen Boulevard. Although the second option is less expensive, the entire wetland is not restored and less treatment area provided. A SLAMM model was created for both diversion options assuming 2 feet of peat soil. This SLAMM Model results are shown in Appendix 5 show a 80% removal of Total Suspended Solids (TSS) for the first option and a 67% removal of TSS for the second option. During the wetland restoration design process, the decision on which water diversion option to use will be determined.

AREA F- Diversion of water is feasible based on the pre-treatment space and peat soils. However, due to the extensive earth movement. Area F is not as feasible as Area D. Placing the elevation of the pre-treatment basin at 853 instead of 850. is a diversion option that decreases the cut required and also increases the filtering depth to groundwater. However, a hydraulic analysis is needed to show no flooding is caused by the back-up of water into the storm sewer system along Allen Boulevard.

The following recommendations are based on the data gathered and analyzed as part of this study:

1. Bank Protection for East and West Park Ditch- The Ditch banks should be protected and the side slope decreased to at least a 3:1 (H:V) slope. A "bioengineering" approach with the lower bank stabilized with rootwads and native, deep rooted plants above with biodegradable erosion netting is recommended to stabilize these banks providing a natural look while still providing the strength and stability needed for erosion protection.

2. Cut creek bank elevations in Area B,C- The elevations of the creek bank should be lowered to allow high flows to enter the wetlands on either side of the Park West Ditch.

3. Divert Stormwater from Allen Boulevard pipe into wetlands at Area D. The 42 inch pipe crossing at Allen Boulevard should be modified to allow low flows to be diverted into the wetlands in Area D south of the active park in Park East as shown in Figure 21. As noted above, soil borings should be obtained to verify the soils and groundwater information during the design process.

4. Divert Stormwater to a combined treatment pond/ wetland in Area F- The stormwater should be diverted to a combined stormwater basin/wetland in Area F as shown in Figure 22 and 23 a-b. A warm water game fish rearing pond is also recommended for this area to increase the multipurpose use. The layout of the pond/wetland/rearing pond is conceptual and

a more natural system will be designed at a later date. As noted above, soil borings should be obtained to verify the soils and groundwater information during the design process.

5. Place interconnected shared-use walking paths along berms for Areas D and F along Allen Boulevard and Middleton Beach Road with interpretive signs to educate public on:

- Wetlands,
- WPDES Permit,
- Soils/Hydrology, and
- Fishes of Lake Mendota.

Figure 24 shows a conceptual layout of this path system.

6. Conduct wetland functionality impact studies for the wetlands in Areas B,C; D and F.

Opinions of probable cost for design and construction of the recommended improvements are listed in Appendix 7 and summarized below:

- Area F- Sediment Basin/Wetland Restoration-$181,750
- Streambank Stabilization- 380 linear feet east of Allen Boulevard- $95,000
- Area D- Sediment Basin/Wetland Restoration-$148,950
- Streambank Stabilization- 1000 linear feet west of Allen Boulevard-$250,000

VI. Funding Opportunities

A number of Funding Programs are available to finance a portion of the improvements described in this report including:

- WDNR Urban NPS Construction Grant- These grants can be utilized to pay 50% of the construction cost not to exceed $150,000. The grant application deadline is April 15 of each year with the grant period extending two years.
- WDNR Wetland Incentive Grant- These grants provide 100% reimbursement up to $10,000 to restore wetlands. The grant application deadline is May 1 of each year.
- WDNR Lake Protection Grant- Grants provide 75% of improvement construction cost up to a $200,000 state share amount. Grant application deadline is May 1 of each year.
- WDNR Dane County Urban Water Quality Grant- provides 50% of the construction cost up to $35,000. Deadline is April 2 of each year In 2007, $100,000 was distributed to municipalities under this program.
- WDNR Recreational Trails Grant - Could be used to finance the trails portion of the berms. Provides 50% of the cost of building a trail and deadline is May 1 of each year.

Appendix 1- Ditch Cross-section Survey Information

Appendix 2-Approximate Pretreament Pollutant Removal

Appendix 3 Site Data for Area B,C

Appendix 4-Site Data for Area D

Appendix 5-Site Data for Area F

Appendix 6- SLAMM Data Results
Area D Diversion

Appendix 7- Opinions of Probable Costs for Recommended Improvements