

DRUID LAKE MANAGEMENT PLAN

PHASE I

Prepared For

Druid Lake Inland Protection and Rehabilitation District

November 14, 1995

Project No. 1949000-330-703

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Introduction

Location And Description

Druid Lake is a 53-foot deep, 124-acre lake located in Section 6 of the Town of Erin in Washington County. The lake is located within the upper reaches of the Ashippun River Watershed.

In addition to the direct drainage area of approximately 481 acres, the lake is fed by the Ashippun River which drains an additional 5,978 acres above Druid Lake for a total watershed of 6,459 acres. The reach of the Ashippun River above Druid Lake primarily drains through wetland and agricultural land prior to flowing into Druid Lake along the lake's east shore. The river then exits Druid Lake along the east shore south of where it enters.

Druid Lake is located within a one-half hour drive of Milwaukee. Because of its location; fishery; and the scenic beauty of the Kettle Moraine area, Druid Lake has been experiencing increased pressures on lake and shoreland use.

Background

Recognizing the need to abate private septic system discharges to Druid Lake and to inventory the Druid Lake/Ashippun River Watershed, the Druid Lake Inland Protection and Rehabilitation District submitted an application to the Wisconsin Department of Natural Resources for a Wisconsin Lake Planning Grant on July 30, 1993. A grant was awarded to the Lake District and work began the following year to address these issues. In doing so, the Druid Lake Inland Protection and Rehabilitation District requested the assistance of R. A. Smith & Associates, Inc. to perform the necessary research and prepare a final report which summarizes their findings.

The research performed as documented in this report identifies the potential impact that private septic systems located adjacent to Druid Lake may have on the water quality of Druid Lake; inventories the existing land use within the Druid Lake watershed; and evaluates existing data to best determine environmental problem areas within the watershed. In addition, a base map of Druid Lake was prepared and will be utilized in future studies to be performed within the lake (i.e. macrophyte and bottom substrate survey).

Scope

The purpose of the Druid Lake Study (Phase I) was to collect, evaluate and prepare a final report on the Druid Lake Watershed using existing data; to inspect and prepare a report on the privately owned on-site sewage disposal systems located adjacent to the lake; and to prepare a base map to be used in conjunction with anticipated future in-lake studies.

Watershed Study

An inventory of sources of pollution from surface water runoff from the Druid Lake watershed was conducted. The watershed area of the lake was delineated on available topographic maps. Land use activities in the watershed were identified based on 1990 aerial photographs from the Southeastern Wisconsin Regional Planning Commission.

Septic System Inventory

Due to their great interest in preserving water quality of Druid Lake, the Druid Lake Inland Protection and Rehabilitation District utilized a portion of the Wisconsin Lake Planning Grant funds to inventory all septic systems around the lake. This study was not intended to invoke regulatory action against landowners with discharge problems or potentially failing systems, but rather to identify the magnitude and location of pollution problems. In many instances, failing systems may be "legal" because of the date of their construction; therefore, neither the Lake District or the County would have regulatory authority. The Study identified problem areas and suggested solutions that would work within the existing regulatory framework and landowners' ability to make improvements. The Southeastern Wisconsin Regional Planning Commission in A Regional Water Quality Plan for Southeastern Wisconsin - 2000 (SEWRPC, 1978) had recommended that an inventory of septic systems around Druid Lake be conducted.

Base Map

A base map for Druid Lake was prepared using the existing hydrographic map of the lake prepared by the Wisconsin Department of Natural Resources and aerial photographs from the Southeastern Wisconsin Regional Planning Commission. This map was produced at a scale of 1 inch = 200 feet and is included in Appendix A.

Watershed Study

The Druid Lake Watershed encompasses an area of approximately 6,459 acres, of which 481 acres is considered a direct drainage area while the remaining 5,978 acres is drained via the Ashippun River through Druid Lake (See Appendix B). Land use activities in the watershed were identified based on 1990 aerial photographs obtained from the Southeastern Wisconsin Regional Planning Commission (SEWRPC). The land use was then identified on an enlarged U.S.G.S. topographic map (See Appendix C).

Land use activities identified from the photographs were broken up into seven different categories. These land uses consisted of cropland, farmstead, residential, wetland, woodland, institutional/industrial, and open space. The corresponding land use acreage and percentage of watershed is displayed in Table 1.

TABLE 1
Druid Lake Watershed Land Use

LAND USE	AREA (acres)	PERCENT
Cropland	2,649	41%
Wetland	1,682	26%
Open Space	834	13%
Residential	728	11%
Woodland	384	6%
Institutional/Industrial	114	2%
Farmstead	68	1%
TOTALS	6,459	100%

Source: R. A. Smith & Associates, Inc.

Soils And Hydrology

Soils

According to the United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey of Washington County, four different soil associations can be found within the Druid Lake Watershed (See Appendix D).

Casco-Fox-Rodman

This soil association is described as well drained to excessively drained soils that have a subsoil of gravelly sandy loam to clay loam. These soils range from very shallow to moderately deep over gravel and sand on outwash terraces.

Land use activities situated on this soil association within the watershed are varied. Cropland, residential, open space, farmstead, woodland, and industrial/institutional are all found on this soil type. The only land use excluded from this soil association is wetland. These soils are generally well suited for septic systems.

Hocheim-Theresa

Characteristics of this soil association include well drained soils that have a subsoil of clay loam which have been formed in loess and the underlying sandy loam to loam glacial till on uplands.

The primary land use associated with this soil association with the watershed is cropland. These well drained soils are moderately suited for septic systems but often require the use of mound systems.

Brookston-Pella-Lamartine

Somewhat poorly drained soils that have a subsoil of clay loam or silty clay loam formed in loess and underlying loam to sandy loam glacial till.

This association is centered around Druid Lake. Primary land uses include residential and cropland. Some open space as well as pockets of wetland are also found on this soil association within the watershed. These soils have relatively high groundwater conditions and are generally not suitable for septic systems.

Houghton-Palms-Adrian

The Houghton-Palms-Adrian association is described as being very poorly drained organic soils along drainageways in depressions and in old lake beds.

The soil association supports cropland and wetland within the watershed. This type of soil is found in the northeast portion of the Druid Lake Watershed and extends south adjacent to the head waters of the Ashippun River. These soils are unacceptable for septic systems.

According to the Washington County Land Conservation Department (1988 study) the average soil erosion rate for the Druid Lake watershed was 2.46 tons/acre/year. Review of the Washington County Agricultural Soil Erosion Control Plan (SEWRPC, 1989), two Public Land Survey sections within the Druid Lake Watershed have average soil rates of 3.0 to 3.9 tons/acre/year. All remaining sections within the watershed have average erosion rates of less than 2.9 tons/acre/year.

Hydrology

From its headwaters in a small wetland and agricultural area, the Ashippun River flows at a low gradient (6 feet/mile) southwest to Druid Lake. The river drains the majority of the Druid Lake watershed (5,978 acres or 93%) and most of the major agricultural fields. Groundwater is probably a large source of water for the lake which is considered within the sand and Gravel Aquifer of the Kettle Moraine. Groundwater flow direction is indeterminate.

Environmentally Sensitive Areas And Potential Problem Areas

Animal Waste

Animal waste contains a number of contaminants that can adversely affect surface and groundwater. In addition, certain constituents in animal waste can impact grazing animals, harm terrestrial plants, and impair air quality. However, where animal waste is applied to agricultural land at acceptable rates, crops can receive adequate nutrients without the addition of commercial fertilizer. In addition, soil erosion can be substantially reduced and the water holding capacity of the soil can be improved if organic matter from animal waste is incorporated into the soil.

The principal constituents of animal waste that impact surface water are organic matter, nutrients, and fecal bacteria. Animal waste may also increase the amount of suspended material in the water and affect the color either directly by the waste itself or indirectly through the production of algae. Indirect affects on surface water can also occur when sediment enters streams from feedlots or overgrazed pastures and from eroded streambanks or unprotected cattle crossings. The impact that these contaminants have on the aquatic environment is related to the amount and type of each pollutant entering the system and the characteristics of the receiving water.

Septic System Inventory

R. A. Smith & Associates, Inc. conducted a septic system inventory in 1994 and 1995 of all 95 lots around the perimeter of Druid Lake. The purpose of the survey was to determine the overall condition of the septic systems and assess the effect these systems have on the water quality of the lake. The systems were evaluated according to the system types found in Table 2.

TABLE 2
Druid Lake
Private Sanitary System Type Summary

DESCRIPTION OF SYSTEM TYPE	NUMBER OF SYSTEMS	PERCENT
Seepage Bed, Trench or Pit	63	66.3 %
Holding Tank	24	25.3 %
Outhouse	7	7.4 %
Unknown	1	1.1 %
TOTAL	95	100 %

TABLE 3
Druid Lake
Private Sanitary System Condition Summary

DESCRIPTION OF SYSTEM CONDITION	NUMBER OF SYSTEMS	PERCENT
Failed System	25	26.3 %
Non-failing System	68	71.6 %
Unknown	2	2.1 %
TOTAL	95	100 %

The results of the septic system condition investigation are indicated in Table 3. The majority of the failing systems were located too low and do not provide adequate separation (and treatment) between the bottom of the system and the groundwater. In most of the failed cases, the seepage systems had been constructed at a depth less than 6 feet above the estimated groundwater surface surrounding Druid Lake.

Sixty eight systems (71.6 %) are considered to be non-failing systems.

State Code requirements have increased significantly since the time many of the lake homes were built. For example, the most common existing system consists of one septic tank and a seepage pit or a seepage bed. The present code for the typical three bedroom home would require approximately seven seepage pits--far more than what is currently provided.

The majority of these sub-code systems are not "failing" by State standards, but are not functioning adequately in their ability to properly "treat" the sewage effluent. At best, the liquid sewage will percolate through the seepage pit, hopefully removing the bacteria and pathogens in the process. However, it is unlikely that adequate nutrient removal will take place in this type of system. The denitrification process requires oxygen, warm temperatures, and bacteria--none of which are likely to be present in the typical seepage pit. As a result, the nutrients will move freely through the permeable sandy soils into the water table. Once into the groundwater system, further treatment will not occur and the nutrients may be transported into the lake.

In general, it is our opinion that undersized or improperly designed soil absorption (septic) systems located in permeable soils may be a potential source of an increase in nutrient levels in the lake. Increased nutrients may add to the eutrophication process of the lake. It is R. A. Smith's recommendation that all soil absorption systems (septic systems) be brought into compliance with current state requirements. On lots that are too low in elevation to the groundwater, the septic system should be replaced with a holding tank, unless a replacement area is available.

On the positive side, all of the problem systems are readily correctable by either replacing or upgrading the existing systems. Replacement areas are available on many lots. Potential replacement methods include conventional systems and mound systems. Holding tanks would be the only suitable system in areas where replacement areas are not available. Also, because of the relatively low number of potentially failing systems, the overall impact to Druid Lake is not considered to be a major concern to the water quality.

Copies of the inspection forms prepared for each site are provided in Appendix E.

Erodible Soils

The two sections identified in the 1989 SEWRPC study as having the highest erosion rates are Sections 31 and 34 in the Town of Hartford. Approximately 123 acres of the south half of Section 31 lie within the watershed. This portion of Section 31 is comprised of steep sloped soils (2% to 35%) from the Casco-Fox-Rodman soil association. The other section identified as having a high erosion rate is Section 34 which is also a part of the Town of Hartford. Section 34 lies entirely within the watershed and consists primarily of low soils from the Houghton-Palms-Adrian soil association. However, steep sloped (2%-35%) soils of the Casco-Fox-Rodman soil association are located in the south half of the section.

In addition to having a high average erosion rate, the SEWRPC report indicated that Section 34 is also considered to contribute the most tons of soil per year to surface waters within the watershed. The report indicated that agricultural lands within Section 34 deliver 75 to 99 tons of soil per year to surface water. Also considered to have the same soil delivery rate to surface waters is Section 6 within the Town of Erin. This high rate of sediment delivery found in Section 6 may be directly attributed to the proximity of agricultural lands to Druid Lake which lies within the section.

A third ranking was provided within the SEWRPC report that grouped areas according to their relative need for soil erosion control practices. The system assigned each section within Washington County a letter A, B, C, or D based upon the average soil loss rate and the amount of excessively eroding cropland identified in each section. Sections grouped in Area A required the most attention in soil erosion control practices, while areas grouped in Area D posed less of a concern. The highest ranking that any section received within the Druid Lake watershed was Letter B. The ranking was given to 3 sections with the watershed (Section 31, 32 and 35).

Wetlands

Approximately 26% (1,682 acres) of the land use within the Druid Lake Watershed is wetlands. The majority of these wetlands lie within the indirect drainage area and vary in composition.

These areas vary from Emergent/Wet Meadows (E2H) of cattails to scrub/shrub, broad-leaved deciduous of varying sizes bordering the eastern edge of the lake. Wetlands are often areas of groundwater recharge and can be very sensitive to human impact. In addition wetlands provide flood storage, wildlife habitat and given the large area of the watershed, the wetlands are probably responsible for trapping much non-point source pollution from the watershed.

Wetland classes are established using vegetation, hydrology and existing geology of a particular site. A typical classification may have up to four identifiers (E1Ka) with the first identifying the class (Wet meadow); the second signifying the subclass (Persistent); the third, a hydrologic modifier (Wet soil, Palustrine); and the last, a special modifier (Abandoned cropland). Further details of Druid Lake wetland classifications are listed in Appendix F. Wetland inventory maps are available from the Wisconsin Department of Natural Resources Bureau of Planning.

Watershed Management Alternatives

Rural Lands Management

Soil Conservation Plans

According to the 1989 SEWRPC report, agricultural lands may contribute a large amount of nutrients to Druid Lake. Because of this, farm operators should incorporate conservation plans which would minimize erosion. If conservation plans are already in existence, farmers should adhere to those plans.

Nutrient Management Plans

In addition to minimizing erosion from agricultural lands, it is also important to minimize the flow of excess nutrients from agricultural land to Druid Lake. Farm operators should develop nutrient management plans which minimize the flow of excess nutrients leaving the farmland. Such plans specify when and how much manure should be spread on cropland.

Woodland and Wetland Preservation and Protection

Both woodlands and wetlands provide positive water quality functions within the watershed. Woodlands are a stable land cover, producing little eroded sediment or nutrients in surface runoff. Currently, woodlands constitute 6% (384 acres) of land cover type in the watershed. It is important to inhibit the transformation of woodlands to residential or agricultural land use since this would have an adverse affect on the water quality of Druid Lake.

Wetlands provide important water quality treatment within the watershed. The land in the indirect drainage basin drains into wetlands. These wetlands absorb and filter nutrients from surface runoff. It is important to preserve and protect these wetlands so this water quality treatment continues.

Construction Site Erosion Control

The nonpoint source pollution today may be agricultural runoff; however, tomorrow the likely problem will be construction site erosion. Development pressures are likely to continue to grow in this region. The Lake Management District, the Towns of Erin and Hartford, and Washington County need to work cooperatively to develop, administer and enforce a Construction Site Erosion Control Ordinance.

Monitoring And Enforcement Of Existing Zoning And Land Use Laws

Request Notification of Proposed Zoning or Land Use Changes

The Druid Lake Inland Protection and Rehabilitation District should be notified of any proposed zoning or land use regulation changes by the local governments so that the district can respond with the best interest of the lake in mind.

Shoreland Zoning Protection

Washington County currently has zoning ordinances pertaining to shoreland management and practices which protect water quality. It is important that shoreland property owners are knowledgeable of these ordinances and follow them.

Wetland Regulations

Shoreland wetlands (those within 1,000 feet from the lake) are protected under the shoreland zoning ordinances of Washington County. Other wetlands are protected under Chapter NR 103 of the Wisconsin DNR Administrative Code which sets water quality standards for wetlands.

Chapter 30 Permit Reviews

Construction or other types of alterations done in a navigable waterway are regulated in Chapter 30 of the Wisconsin State Statutes. Permits are required for a number of activities and must be reviewed. The Lake Management District should be notified by the appropriate personnel upon the review of any such permits for work taking place within the Druid Lake watershed.

Army Corps of Engineers Public Notices

Likewise, the Army Corp of Engineers regulates activities in navigable waterways and wetlands which require permits. The Lake Management District can request to be notified of any such permit requests within the Druid Lake Watershed.

Information And Education

Newsletters

Newsletters put out by the Druid Inland Protection and Rehabilitation District can be a good way to distribute information about practices which would improve water quality such as shoreline management. Brochures describing appropriate land management practices could be inserted into the newsletter. Many such brochures are available from the University of Wisconsin-Extension. Newsletter distribution could extend to all residents of the watershed to help expand the community of people concerned about the water quality of Druid Lake.

Demonstration Projects

Demonstration projects such as the planting of buffer strips between croplands and wetlands would be a good way to promote such practices among the residents of the watershed.

Riparian Land Use

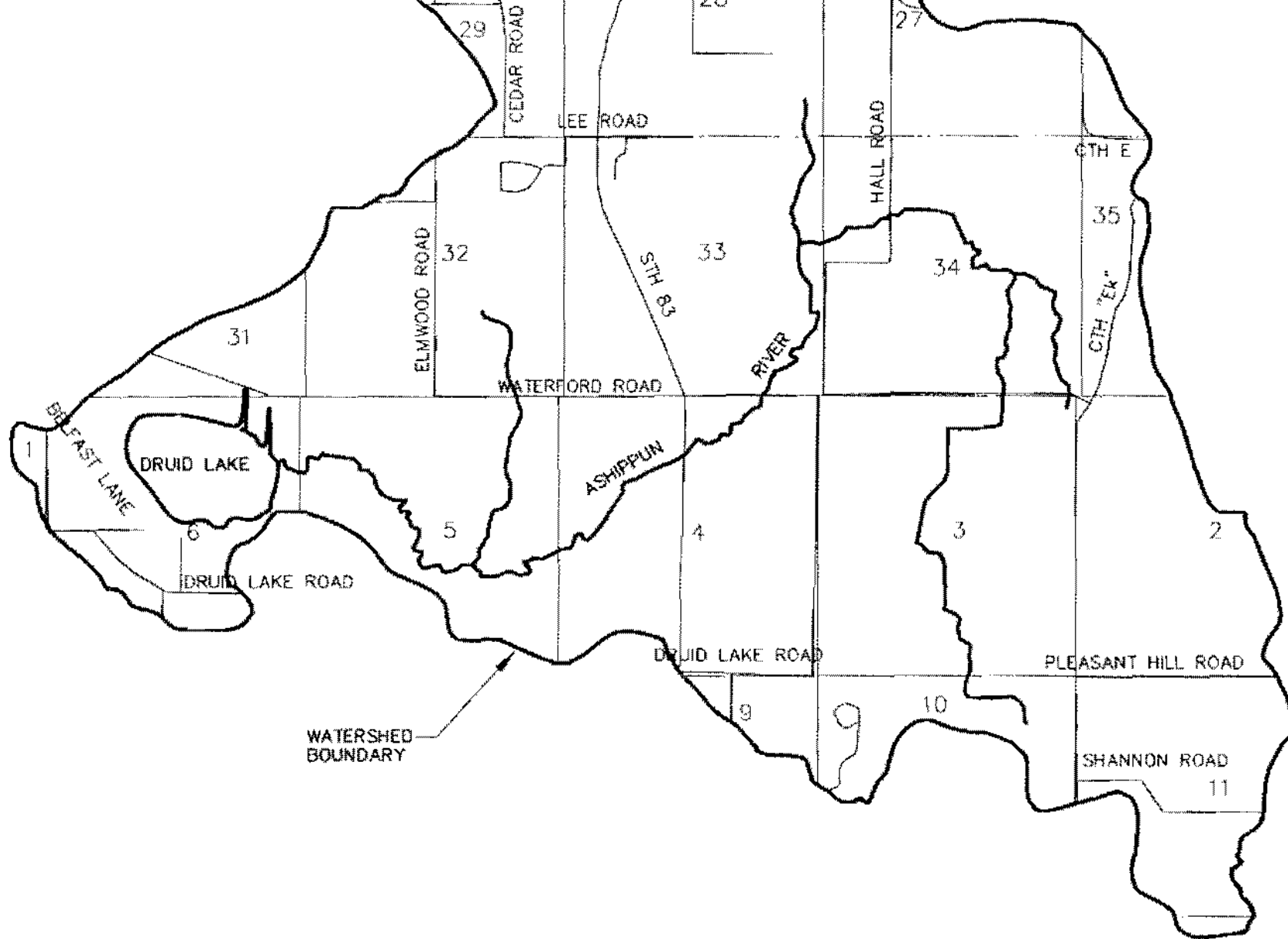
The University of Wisconsin - Extension has good information on appropriate land management practices for protecting water quality. Many brochures are available. UW-Extension agents are also sometimes available for on-site visits.

Recommendations And Alternatives

Based on the results of the private sewage disposal systems inspections and the evaluation of existing data collected on the Druid Lake Watershed, R. A. Smith & Associates, Inc. recommends the following to the Druid Lake Inland Protection and Rehabilitation District in support of their efforts to improve the water quality of Druid Lake:

1. Failing septic systems identified during the septic system survey should be replaced with reliable systems that will provide adequate treatment of waste discharges prior to seeping into the groundwater that surrounds and feeds Druid Lake. Older systems not meeting codes should be brought into compliance over time.
2. Agricultural lands identified in the 1989 SEWRPC report should be evaluated more closely. Areas of concern that need to be addressed revolve around the erosion rates of cropland and their impacts to nearby surface waters within the watershed, more specifically, Druid Lake and the Ashippun River. Suspended solids from soil erosion is a major source of phosphorus into Druid Lake. Another area of concern to be further evaluated is the distribution of animal waste on cropland and pastures within the watershed and their proximity and potential impacts to surface waters.

3. Recommendations made to the Druid Lake Inland Protection and Rehabilitation District by the Wisconsin Department of Natural Resources in the recently published "Upper Rock River Basin Water Quality Management Plan," July 1995, concerning an application for a lake planning grant to address water quality threats and problems in Druid Lake, should be supported and sought by the Lake District.



WATERSHED
BOUNDARY

R. A. SMITH
& ASSOCIATES, INC.

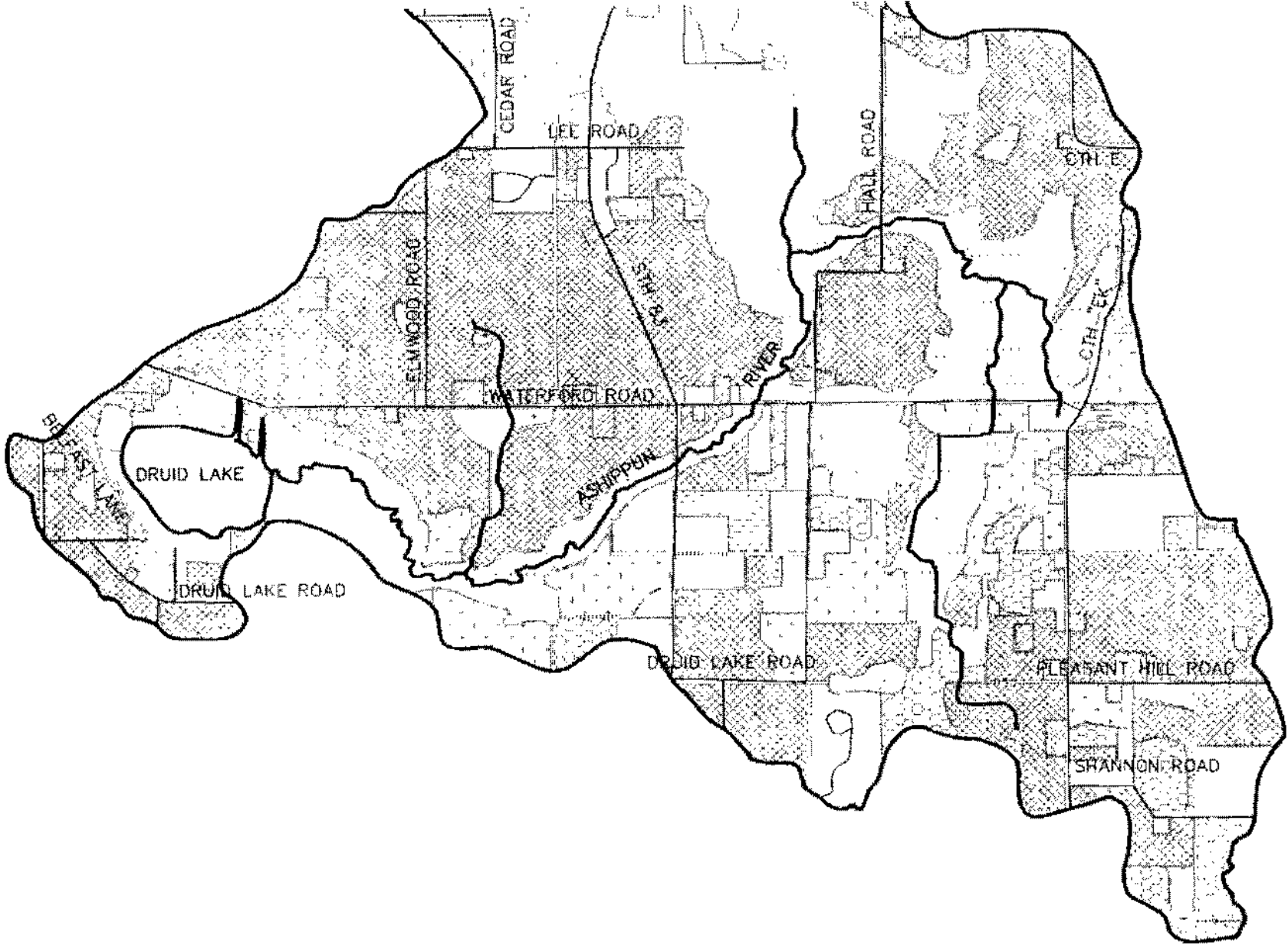
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driven by 16745 W. Bluemound
vision Brookfield, WI 531

DRUID LAKE INLAND PROTECTION AND REHABILITATION DIS
WASHINGTON COUNTY




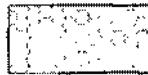
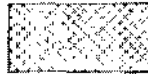

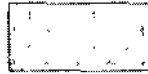
DRUID LAKE WATERSHED MAP

SCALE	1" = 3000'	JOB NO.	1849000-330-702	DATE	
DESIGNED BY:	OJC	DRAWN BY:	NMG	CHECKED BY:	PAJ
REVISED:					

SHEET 1



LEGEND

-  INDUSTRIAL / INSTITUTIONAL
-  WETLAND
-  FARMSTEAD
-  WOODLAND
-  CROPLAND
-  RESIDENTIAL
-  OPEN SPACE

R. A. SMITH Engineering 414-786-
 & ASSOCIATES, INC. vision 16745 W. B.
 Brookfield

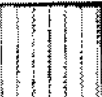
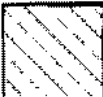
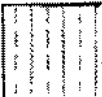
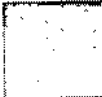
DRUID LAKE INLAND PROTECTION AND REHABILITATION
 WASHINGTON COUNTY

DRUID LAKE LAND USE MAP

SCALE: 1"=3000' JOB NO. 1949000-330
 DESIGNED BY: DJC DRAWN BY: MMG CHECKED BY: PAJ
 REVISED: SH



SOIL ASSOCIATION

-  Brookston—Pella—La
-  Casco—Fox—Rodmar
-  Hocheim—Theresa
-  Houghton—Palms—A

R.A. SMITH *Engineering & Surveying*
 1480 C STREET, N.W.
 WASHINGTON, D.C. 20004

DRUID LAKE INLAND PROTECTION AND
 WASHINGTON COUNTY

DRUID LAKE SOIL ASS.

SCALE: 1" = 3,000'
 DRAWN BY: DMC
 CHECKED BY: [Name]
 JOB NO. 194