Russ Dunst

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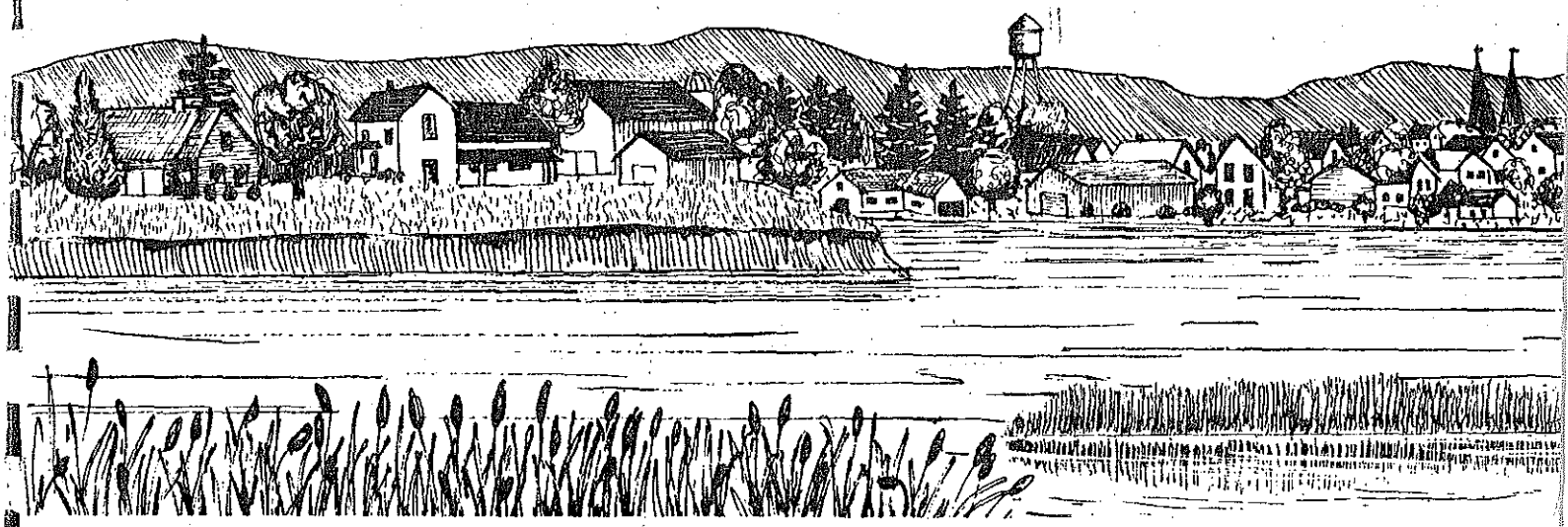
Wilson Lake Management Plan

Prepared For: Kusel - Wilson Round Inland Lakes Protection and Rehabilitation District



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October 23,1980

Kusel, Wilson, and Round Inland Lake Protection
and Rehabilitation District
Route 2, P.O. Box 1357
Wild Rose, WI 54984

Attn: Mr. Orville Huss

Re: Draft Wilson Lake Management Plan
Donohue Project No. 10989.0

Gentlemen:

We are pleased to present herewith the draft Wilson Lake Management Plan which presents our recommendations for the protection and rehabilitation of Wilson Lake.

Successful implementation of a selected plan will depend heavily on local understanding of the problems confronted, the solutions recommended and the benefits to be gained. Because the final decision to implement a management plan will be made by members of the Lake District, the selected plan should reflect their needs, desires and also be compatible with water quality standards and objectives established by governmental agencies.

We wish to thank the Lake District for their assistance and cooperation during the course of this important project for Wilson Lake and look forward to working with you on whatever course of action you decide to pursue.

Respectfully submitted,

DONOHUE & ASSOCIATES, INC.

Richard E Fedler by JAP

Richard E. Fedler, P.E.
Vice President

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Project Manager

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SUMMARY

Wilson Lake experiences a number of problems which reduce aesthetics and recreational activity on the lake. The main problems have been over abundant weed growth and shallowness caused by sedimentation.

A 1976 study under Wisconsin's Inland Lake Renewal Program conducted by Environmental Research Assessments, revealed that Wilson Lake could be classified as mesotrophic without significant cultural influence. From the data collected on Wilson Lake, the Department of Natural Resources (DNR), Office of Inland Lake Renewal, developed a list of possible management alternatives which could be considered for implementation. These measures include protection of near shore areas from intense usage/development, dredging, weed harvesting, herbicide treatment, and aeration/circulation. In August of 1979, Donohue & Associates was requested by the Kusel, Wilson and Round Lake Protection Rehabilitation District to review lake management alternatives for Wilson Lake. At the District's annual meeting in 1979, Wilson Lake property owners decided to develop a lake management plan including dredging as the main element.

Goals and objectives were developed locally during the management planning process for this project. These goals included rehabilitating Wilson Lake to increase the value of this water resource for aesthetics, recreation, and environmental protection and to preserve it for future generations. The management plan considered three dredging alternatives. These include the following:

Alternative 1

This alternative would remove approximately 500,000 to 600,000 cubic yards of sediment and create two deep zones in the east and west basins of the lake. Dredging would be to a depth of ten feet. It is expected that the results of this alternative would be a long-term solution to lake problems.

Alternative 2

This alternative only considers dredging in the east basin and removing approximately 300,000 to 400,000 cubic yards of sediment. Sediment would be removed to a depth of ten feet. The area of material removal is the same as described under alternative 1. Although no dredging is proposed for the west basin, this area currently contains a small deep basin and greater overall depth than the east basin. Results of this alternative are expected to be a relatively long-term solution to lake problems.

Alternative 3

This alternative considers two large zones of sediment removal in the east basin and two limited zones of sediment removal in the west basin of approximately 200,000 to 300,000 cubic yards. East basin dredging would consist of two connected zones which would be dredged to a depth of ten feet. This area would be surrounded by a shallow dredging zone of five feet encompassing the remainder of the east basin except for near shore areas. West basin dredging would consist of limited five and ten foot dredging zones, in the

southwest corner of the lake. This dredging is designed to revive springs to promote groundwater flow. It is expected this alternative would be a relatively long-term solution to the problems.

The recommended dredging option of Wilson Lake is alternative 3. The sediment would be pumped from Wilson Lake to a disposal lagoon where the suspended material would settle out. The lagoon would be sized for 225,000 cubic yards of sediment to be removed from the lake including sufficient volume for retention of the carriage water. The lagoon would be ten to twenty acres for sediment stored ten feet deep. A dike would be constructed to enclose the lagoon. Preliminary investigations reveal a disposal site approximately one-half mile northwest of the lake. From the lagoon, carriage water would pass through a screen to remove any unsettled particles prior to flowing by gravity through a piping system back to Wilson Lake.

Other elements in the recommended plan include watershed protection measures such as efforts to institute best management practices on agricultural land and construction sites and shoreline protection. If nuisance weed growth returns to Wilson Lake, harvesting could be investigated and implemented in conjunction with other nearby lakes with similar problems.

The estimated cost for this project will be approximately $520,000 for the dredging, $50,000 to $60,000 for engineering fees, and $37,000 to $47,000 for construction related services. Funding for this project will most likely be from the Wisconsin Department of Natural Resources, Office of Inland Lake Renewal, and the EPA Clean Lakes Program. Construction is tentatively set to begin in September of 1981 and be completed in September of 1983.

If the Wilson Lake residents decide to proceed with this plan, a final lake management plan can be submitted to the Office of Inland Lake Renewal. This final management plan will require some additional analysis of bottom sediments from Wilson Lake before it can be submitted.

DONOHUE & ASSOCIATES, INC., PROJECT STAFF

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Darla F. Petrie	Drafting Technician

CHAPTER 1

GOALS AND OBJECTIVES

›als and objectives for the proposed Lake Rehabilitation Project were derived om a series of public meetings with Lake District Commissioners and local ;izens. The following are the goals and objectives developed for this ·oject:

Goal:

Rehabilitate Wilson Lake to increase the value of this water resource for aesthetics, recreation, and environmental protection.

Objective:

Enhance water quality by deepening Wilson Lake through dredging accumulated sediment from the lake bottom.

Goal:

Protect Wilson Lake from water quality degradation so it can be preserved for enjoyment by future generations.

Objectives:

Encourage cooperation among Wilson, Kusel, and Round Lakes to institute lake management measures which can be of mutual benefit.

Encourage the institution of voluntary land management practices among landowners in the watershed to control the input of nutrients and sediments to Wilson Lake.

Provide continued monitoring of the water quality of Wilson Lake to detect potential problems.

CHAPTER 2

BACKGROUND

To understand the problems of Wilson Lake and plan for its protection and rehabilitation, it is important to understand the background of this water resource. Wilson Lake has a surface acreage of 56 acres and a small direct watershed since it has no tributary streams. Wilson Lake is a spring-fed lake whose primary source of inflow is groundwater. Water leaves the lake through groundwater outflow at the east end and through a small outflow on the northwest corner of the lake which eventually reaches the Pine River. The water level of Wilson Lake is maintained approximately one to two feet above natural conditions by a control dam. The main problems of Wilson Lake have been overabundant weed growth and shallowness caused by sedimentation. The sediment accumulation is believed to be primarily generated internally through decaying organic matter. About 70 percent of the lake is affected by aquatic vegetation. The shallowness is most pronounced in the east basin of the lake. Lake bathymetry is shown on Figure 1.

Historically, a number of measures have been taken to alleviate the lake's problems. A weed cutter rake was used for several years and some areas have received herbicide applications. A limited dredging attempt using conventional drag line equipment was unsuccessful illustrating the extent of the sediment problem. Sand blankets and fish toxins also proved unsuccessful.

In 1974 the Kusel, Wilson, and Round Lake Protection and Rehabilitation District was formed. The District requested technical assistance from the Wisconsin Department of Natural Resources, Office of Inland Lake Renewal, which developed the framework for a one-year data collection program. This study, which was completed in 1976 by Environmental Research Assessments, revealed that Wilson Lake could be classified as mesotrophic without significant cultural influence. From the data collected on Wilson Lake, the Office of Inland Lake Renewal developed a list of possible management alternatives which could be considered for implementation. These measures included protection of nearshore areas from intense usage/development, dredging, weed harvesting, herbicide treatment, and aeration/circulation.

In August of 1979, Donohue & Associates was requested by the Kusel, Wilson, and Round Lake Protection and Rehabilitation District to review the management alternatives for Wilson Lake. The District had previously decided that costs for improvements made exclusive to any one lake would be borne by the property owners of that lake. At the Lake District annual meeting in August of 1979, the Wilson Lake property owners decided to proceed with the development of the Lake Management Plan that would involve dredging as the main element.

Wilson Lake, like nearby lakes, is an important tourist attraction within Waushara County. The lake is heavily used for boating, swimming, and fishing. The lake's fishery consists of northern pike, walleye, large mouth bass, and panfish. The lake is also frequented by various types of water

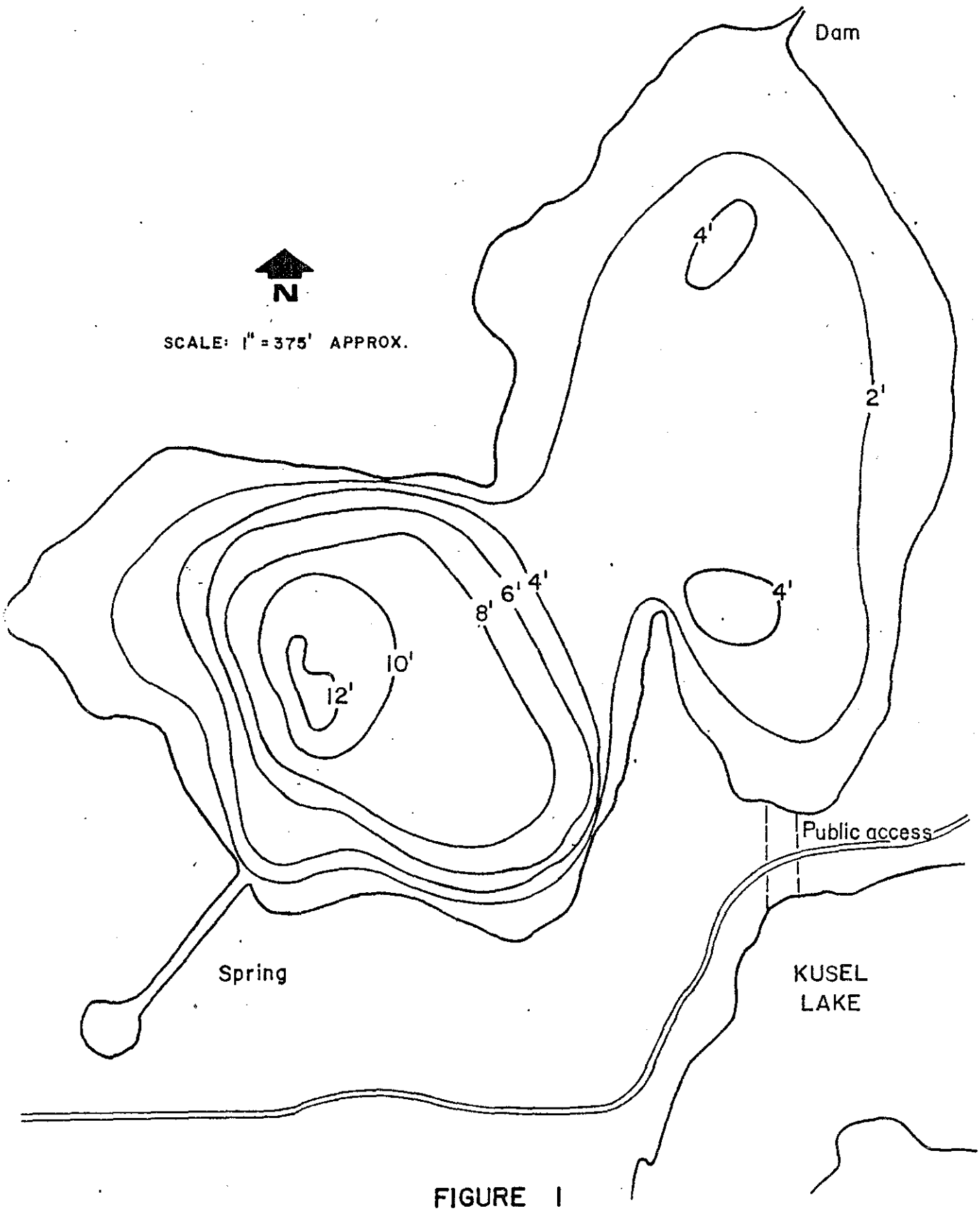

FIGURE 1
WILSON LAKE BATHYMETRY
WILSON LAKE, WISCONSIN
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fowl. Development around Wilson Lake consists of campgrounds and 45 year-round and seasonal residences. Its watershed is largely undeveloped consisting of open space and agricultural lands. The lake's recreational potential cannot be achieved because of restrictions resulting from its present condition.

CHAPTER 3

DREDGING ALTERNATIVES

Because of the significance of the shallowness of Wilson Lake, lake residents have decided the most acceptable solution for lake rehabilitation are alternatives which deal with dredging. Donohue & Associates concurred that dredging was the most effective and feasible solution to the rehabilitation of Wilson Lake.

Alternatives dealing with other aspects of protecting and rehabilitating the lake are not likely to provide enough improvement to lake characteristics to be considered viable. However, these other management considerations can be incorporated into a complete lake mangagement program of which dredging would be a component.

Three alternatives were considered for a dredging plan. These alternatives considered dredging zones to a depth of five to ten feet. Dredging to greater depths is not viable because of the need for aeration equipment, the high cost, and limited benefits over a more moderate dredging program. The selected method of removal would be through hydraulic dredging because of lower cost and improved timing. The following is a detailed description of the three lake dredging alternatives. A comparison of lake management alternatives is contained in Table 1.

Alternative 1

This alternative considers creating of two deep areas within Wilson Lake through dredging in both the east and west basins. These areas are shown on Figure 2. Dredging in the east basin would include removal of material to a depth of ten feet throughout most of the basin except for the nearshore areas and areas of wetland influence. Dredging in the west basin would also be to a depth of ten feet and would be concentrated around the existing deep basin. Dredging in both basins would involve a steep slope cut parallel to the shoreline except where littoral habitat exists or would be created. Steep slope cuts would be necessary to restrict aquatic vegetation from encroaching into the lake basin proper. This dredging option would involve removal of approximately 500,000 to 600,000 cubic yards of sediment.

The results of this alternative are expected to be a long-term solution. The lake's recreation potential should increase and present terrestrial and aquatic plant and animal communities should be enhanced by providing a more balanced habitat.

Alternative 2

This alternative includes dredging only in the east basin. Sediment would be removed from the basin to a depth of ten feet. These dredging areas are shown on Figure 3. The area where the material would be removed is the same as described under Alternative 1. A steep slope cut parallel to the shoreline would be necessary to prohibit an aquatic vegetation from encroaching into the lake basin proper. Approximately 300,000 to 400,000 cubic yards of sediment would be removed under this alternative.

TABLE 1

WILSON LAKE DREDGING ALTERNATIVES

	Alternative 1	Alternative 2	Alternative 3
Volume Removal	500,000 - 600,000 cu yds	300,000 - 400,000 cu yds	200,000 - 250,000 cu yds
Cost @ $2.30 cu yd	$1.15 - $1.38 million	$690,000 - $920,000	$460,000 - $575,000*
Dredge Type	Hydraulic/Cutterhead	Hydraulic/Cutterhead	Hydraulic/Cutterhead
Disposal Sites	30 - 45 acres	20 - 35 acres	10 - 25 acres
Timing	24 months	12 - 24 months	12 - 24 months
Mobility	No anticipated problems	No anticipated problems	No anticipated problems
Environmental Concerns	Maintains and enhances present terrestrial and acquatic habitat	Maintains and enhances present terrestrial and acquatic habitat	Maintains and enhances present terrestrial and acquatic habitat
Maintenance Management	Long-term solution to lake problems	Long-term solution to lake problems if properly managed	Long-term solution to lake problems if properly managed

*The limited dredging area of the west basin for spring revitalization may not prove feasible in a cost benefit analysis.

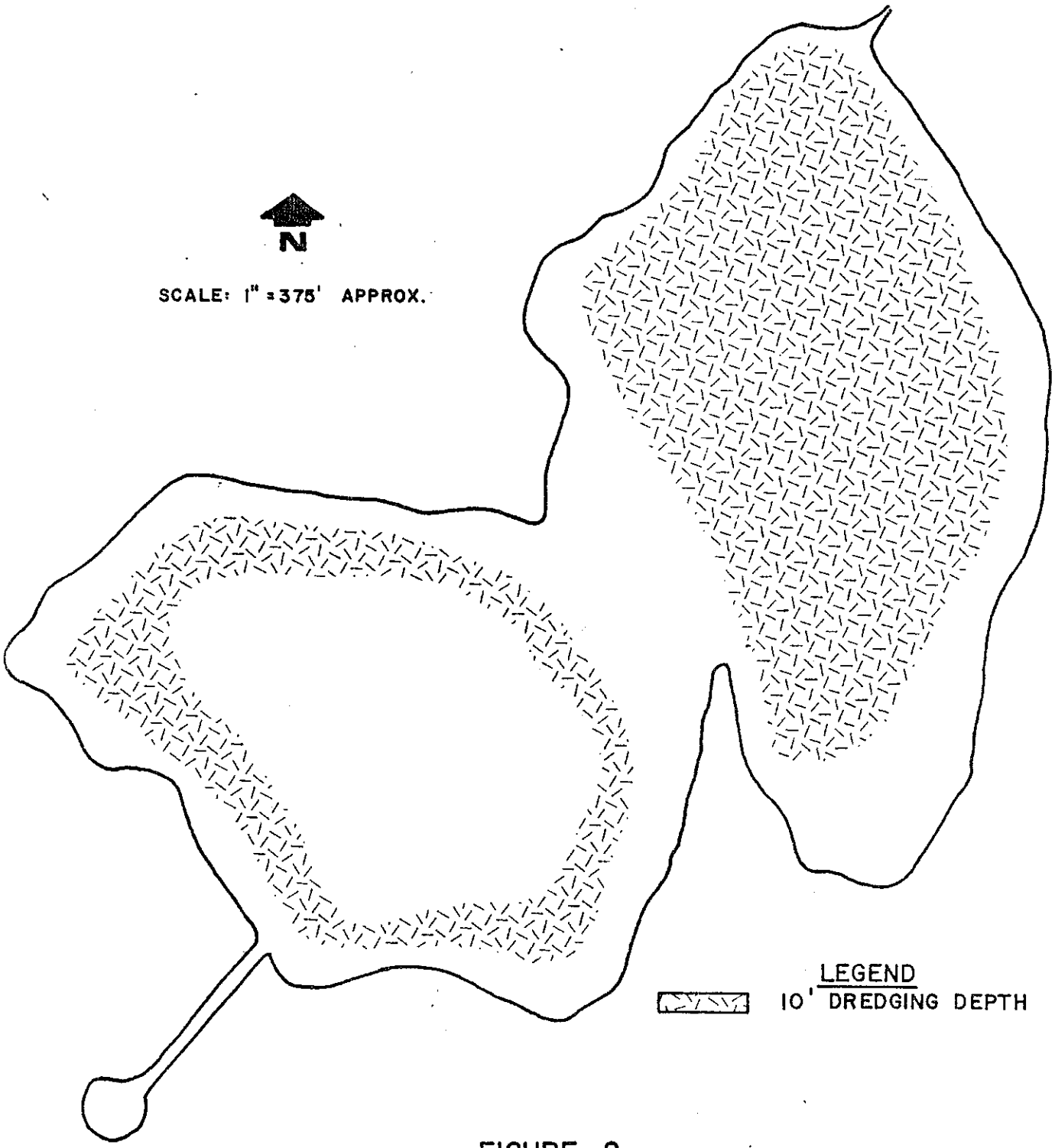

FIGURE 2
ALTERNATIVE I
WILSON LAKE, WISCONSIN
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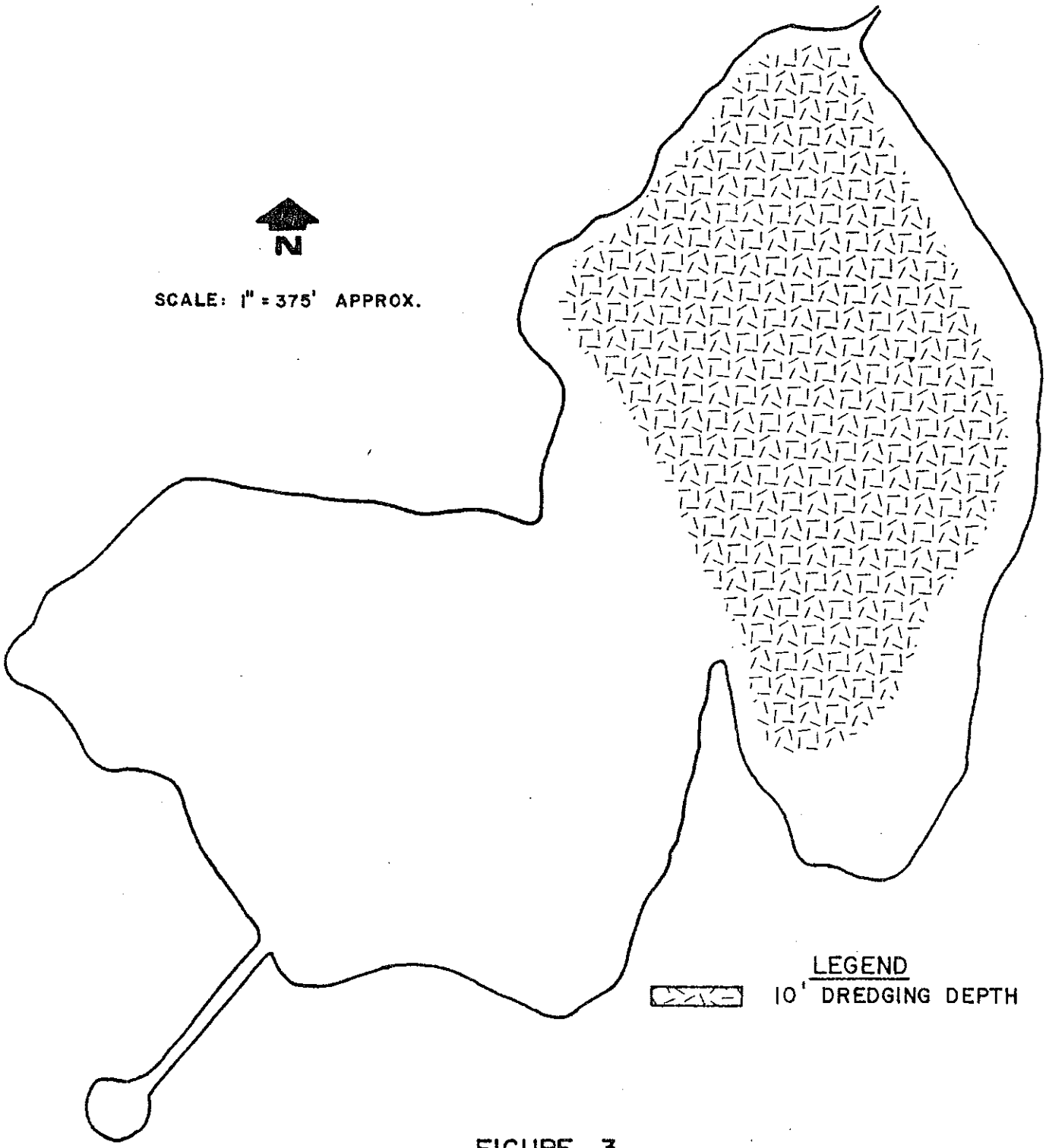

FIGURE 3
ALTERNATIVE 2
WILSON LAKE, WISCONSIN
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The results of this alternative would be a relatively long-term solution to lake problems. It should increase recreation potential and maintain and enhance present terrestrial and aquatic plant and animal communities by providing a more balanced habitat. Although no dredging is proposed for the west basin, this area currently contains a small deep basin and greater overall depth than the east basin.

Alternative 3

This alternative involves two large zones of sediment removal in the east basin and two limited zones of sediment removal in the west basin. These dredging areas are shown on Figure 4. East basin dredging would consist of two connected zones which would be dredged to a depth of ten feet. This area would be surrounded by a shallow dredging zone which would include the remainder of the east basin except for nearshore areas. This area would be dredged to a depth of five feet. Dredging in the west basin would be limited to the southwest corner. It would consist of a deep zone dredged to a depth of ten feet which would connect with the existing deep basin. A shallow basin would be dredged to a depth of five feet and extend from the nearshore area to the deeper zone. In addition to providing increased water volume area in the west basin, this dredging area would also be designed to re-establish springs or groundwater inflow to the lake. A steep slope cut parallel to the shoreline would be necessary to prevent vegetation from encroaching into the lake basin proper. The transition zone between the shallow and deep zones should be cut at a slope which exceeds 30 degrees. A typical cross-section of proposed dredging in the east basin is shown on Figure 5. Approximately 200,000 to 300,000 cubic yards of sediment would be removed under this alternative.

This alternative should result in a long-term solution to lake problems. It should increase the lake's recreation potential and maintain and enhance present terrestrial and aquatic plant and animal communities by producing a more balanced habitat. The reactivating of springs in the west end of the lake should promote circulation within the lake.

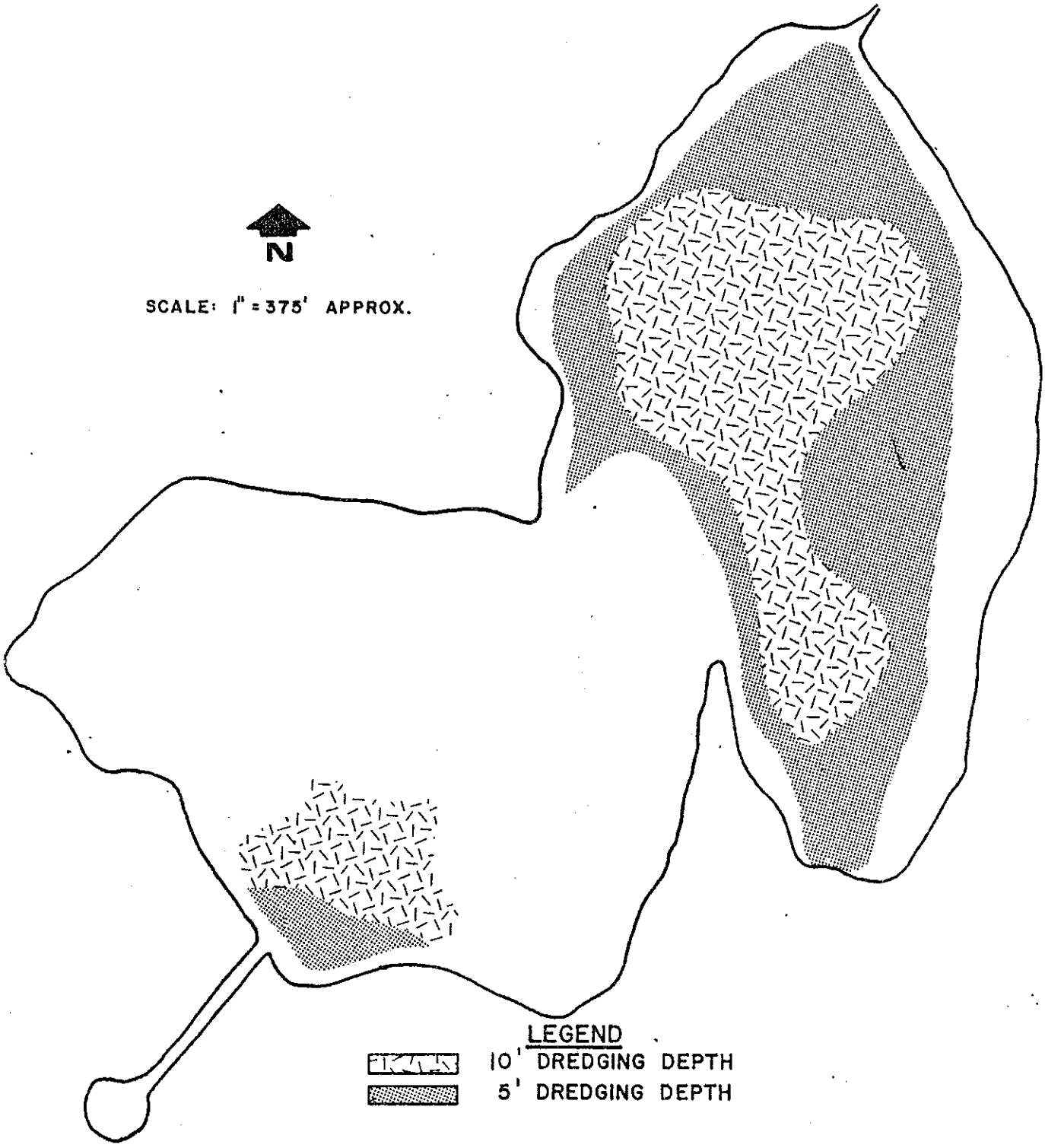

FIGURE 4
ALTERNATIVE 3
WILSON LAKE, WISCONSIN
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FIGURE 5

TYPICAL WILSON LAKE CROSS-SECTION

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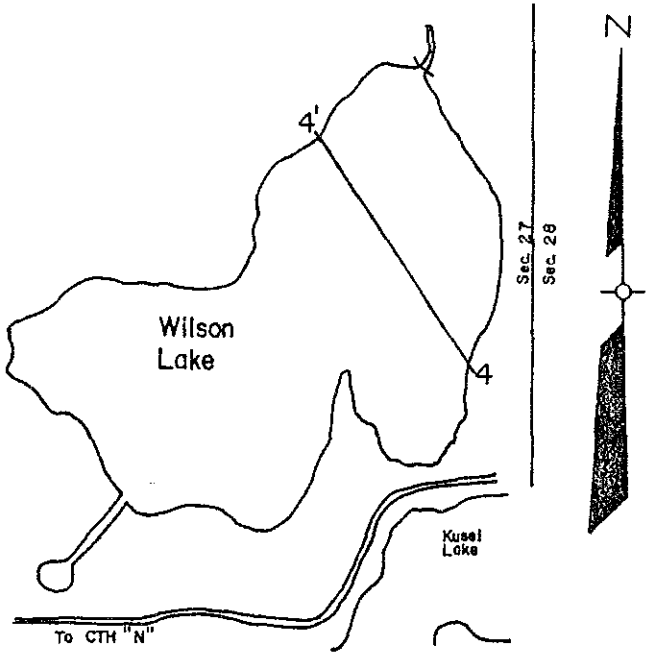
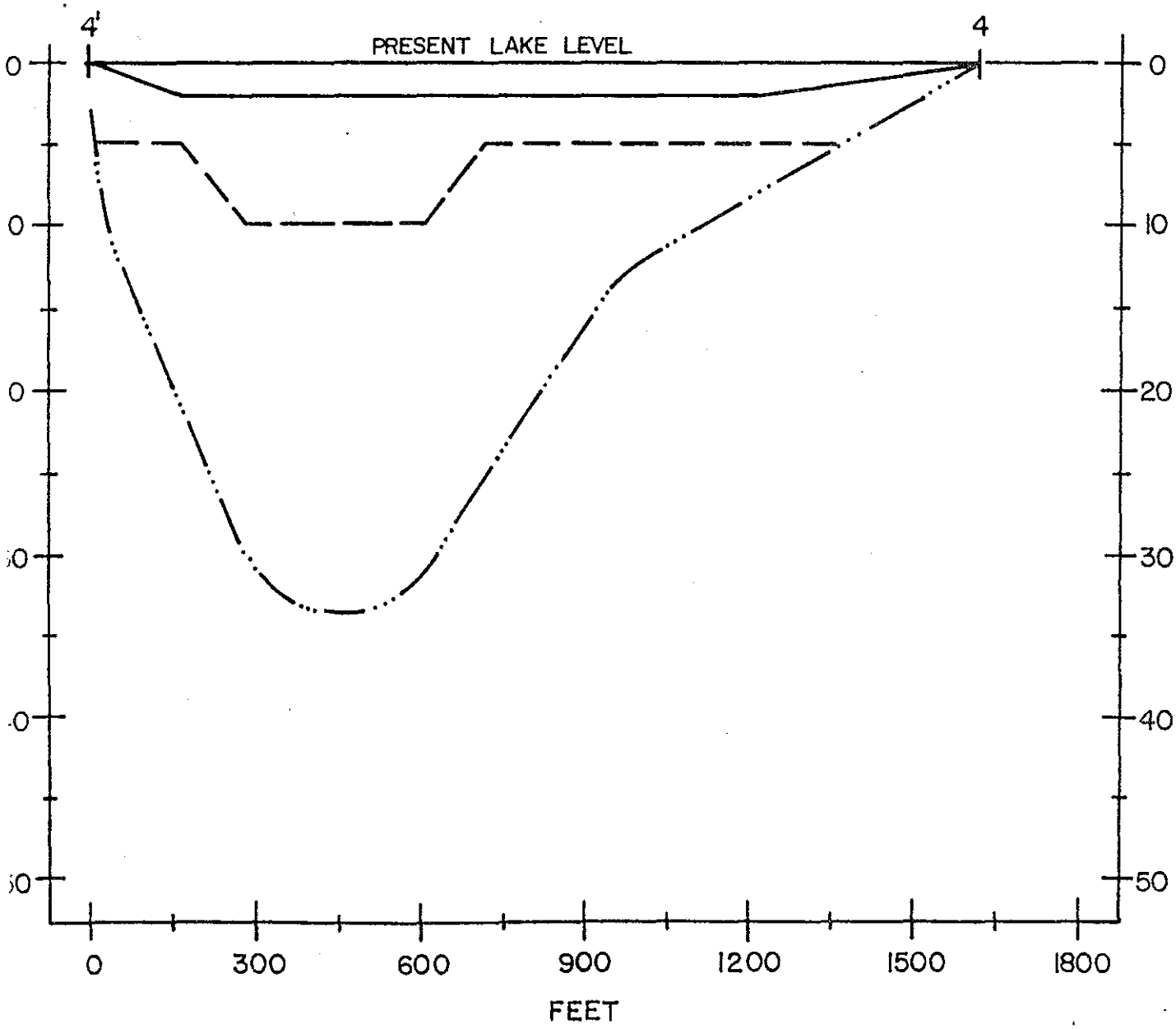
LEGEND

PRESENT LAKE LEVEL
PROPOSED DREDGING DEPTH
HARD BOTTOM



LOCATION MAP



CHAPTER 4

DETAILED EVALUATION OF DREDGING METHODS

Sediment Removal Techniques

Sediment would be removed from Wilson Lake by means of hydraulic dredging. Hydraulic dredges utilize a centrifugal pump to move a slurry of water and material from the lake bottom and transport it through a piping system to a discharge point. Because of differences in sediment and operating conditions, four basic types of dredges have been developed including: the cutterhead dredge, hopper dredge, sidecasting dredge, and dustpan dredge. The dustpan and sidecasting dredge are typically used in special sands. The hopper dredge, as the name indicates, pumps sediments into a hopper which transports it to a disposal location. Furthermore, the hopper dredge is suitable for pumping hard material. The cutterhead dredge, in light material, removes sediment with a rotary cutter or plain suction inlet and pumps it to a disposal location. For this project, the cutterhead dredge is most applicable.

In discussing the unit cost for hydraulic dredging, a number of factors must be considered. These include the following:

- Total project size in terms of quantity of material to be pumped.
- Pumping distance to the disposal site.
- Characteristics of material to be pumped.
- Site preparation of the disposal area.
- Moving in and setting up the dredge and piping.
- Shutdown and restoration.

Regarding the project size and quantity of sediment to be hydraulically dredged from Wilson Lake, unit costs should not change substantially for the range of 220,000 to 600,000 cubic yards of sediment proposed for this project. The base unit cost of hydraulic dredging sediments from Wilson Lake is estimated to be $2.30 per cubic yard. This unit cost includes moving the equipment in and setting up the dredge and piping, site preparation for a disposal lagoon, piping of sediment to a distance of approximately one-half mile, and shutdown and cleanup. If the disposal site is more than one-half mile from Wilson Lake, an additional $.20 per cubic yard for subsequent 2,500 foot increments should be added to cover the cost of the booster pumps and pipes required to transport the sediment.

Hydraulic dredging of sediments from Wilson Lake will likely require up to two construction seasons or approximately 20 to 24 months. The major work elements for this construction schedule are as follows:

- Preparation of the disposal site.

- Moving in and setting up the dredge and piping.
- Hydraulic pumping of the sediment from the lake to the disposal site.
- Shutdown and cleanup.

Disposal/Storage

Sediment dredged from Wilson Lake would be pumped into a disposal lagoon. This lagoon would be a settling basin in which sediment would drop out of the pump slurry. The lagoon would be sized to accommodate the total amount of dredged sediment and include sufficient storage for a minimum retention. The lagoon area, depending on the volume removed, may range from between 20 to 45 acres. For sediment stored 10 feet deep considerably less acreage should be utilized if sequential filling of individual cells of the lagoon is undertaken. Arrangements must be made with the owner(s) of the disposal site(s) to borrow material for the earthen dikes to enclose the lagoon(s). The dike material should be composed of a silty clay material that has more than one half of its particles finer than a number four sieve. If suitable material is not available at the site it will have to be brought in from other areas. The dike will be twelve feet high, including two feet of freeboard, and the top width will be ten feet with side slopes three feet horizontal to one foot vertical (see Figure 6).

Carriage water used to transport the dredge sediment to the lagoon can be handled in two ways as follows: (1) land application and (2) return to Wilson Lake.

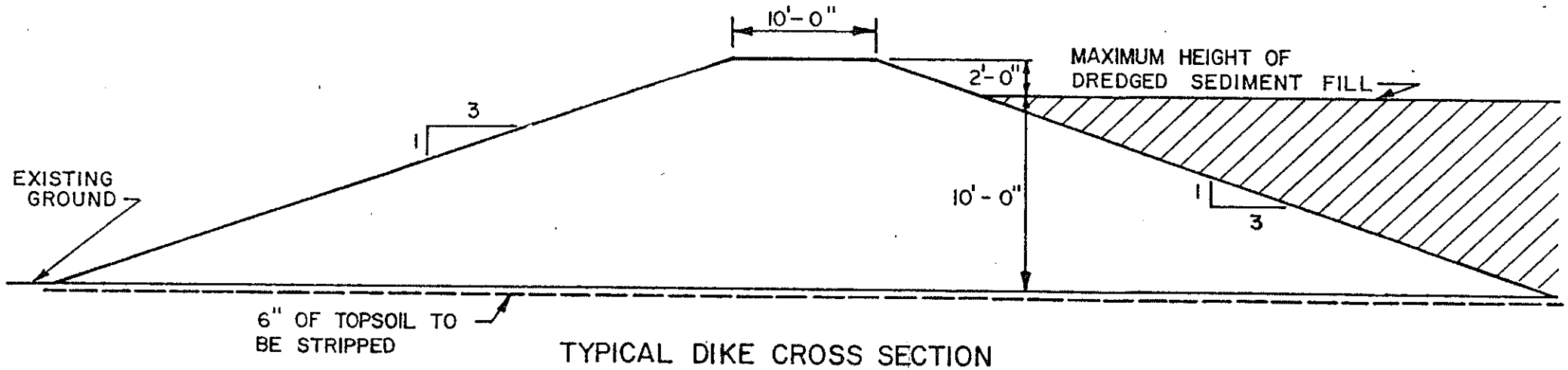
Land Application

The land application process includes both surface and subsurface methods.

Surface Application

Surface application includes spray irrigation or ridge and furrow irrigation. Spray irrigation would utilize a portable, large-nozzled gun(s) and spray pressure between 80 to 100 pounds per square inch (psi). Spray irrigation can be used year-round if provisions are made for drainage in the winter; however, there are several disadvantages to this method. Spray irrigation would not be suitable in an area where odor, whether real or perceived, is a problem, such as near areas of residental development. Plant damage may also occur if the carriage water is sprayed on growing crops. The sprayed carriage water is a component of the slurry which may include ten to twenty percent solids. While the slurry is in the lagoon, settling would occur, although some suspended material is retained in the carriage water. The characteristic of suspended material retained in carriage water would not be detrimental to any form of land application. A settling lagoon would allow holding sufficient volumes of pumped material such that it could be applied to the land in accordance to seasonal agricultural operations.

For ridge and furrow irrigation, the land must be prepared in advance. Like spray irrigation, this method can be utilized year-round if provisions are made for draining pipes in the winter. Ridge and furrow application would however, require relatively level land (1/2 percent to 1-1/2 percent slope). Since there are a number of relatively flat areas near Wilson Lake, this method of surface application would be applicable.



TYPICAL DIKE CROSS SECTION

SCALE: 1"= 10'-0" HORIZONTAL
1"= 10'-0" VERTICAL

FIGURE 6
PROPOSED DIKE FOR LAGOON
WILSON LAKE, WISCONSIN
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1980

Subsurface Application

Subsurface land application has a number of advantages over surface application. Because odor is not a problem and runoff is minimized, public acceptance may be better. Two methods of subsurface application are plow-furrow-cover and subsurface injection. The plow-furrow-cover approach involves discharging the carriage water in a narrow swath from a tank truck and immediately covering it with a plow. This method depends on climatic conditions and requires smooth-level or slightly sloping land. For subsurface injection, a tool, such as a chisel or sweep, opens a channel in the soil, and the liquid then flows into the opening, either by gravity or under pressure. This approach is only suitable in soft, dry soils and for level or slightly sloping land.

Return Water Flow

The second alternative for disposal of carriage water would be to return it to Wilson Lake. This approach would require sufficient retention of the dredge slurry within a lagoon. Retention removes the suspended material, which effectively reduces both turbidity and contaminant levels. Laboratory analysis will have to be conducted to determine the minimum detention time to meet water quality standards set by the Wisconsin Department of Natural Resources, Lake Michigan District. After the required retention time or concentration is met, the carriage water would leave the lagoon and pass through a screen to remove any unsettled sediment. The return water would flow through a piping system and discharge into Wilson Lake.

Polymer Addition

To decrease the retention time and still meet the water quality standards, chemical flocculation of the lagoon effluent could be used for increasing the rate of settleability of suspended solids. Field tests have been conducted with chemical flocculation in conjunction with a fresh water channel modification project by Dredging Operations Technical Support Program with the Department of Army, Corps of Engineers, Vicksburg, Mississippi. The results from the field test indicate that chemical treatment is effective in reducing effluent suspended solids from dredged material contained within a lagoon.

The cost for the chemical addition was about $80 per hour of dredging (1980 dollars) at 27 cubic feet per second (cfs) and at a solids level in the range of 0.5 to 2.0 grams per liter. To determine the suitability of polymer addition in a Wilson Lake dredging operation, additional laboratory testing would be necessary.

Artificial Wetlands

To assist in the removal of nutrients from the return carriage water, an artificial wetland could be established. The wetland would remove suspended materials from the carriage water before it would be returned to the lake.

To establish this wetland, a series of about ten to twenty bermed cells would be developed, with a sufficient retention time to remove a high percentage of nutrients in the return carriage water. The cells would be ten to twenty feet

wide and about 100 feet long. The bottom of the cell should be shaped to distribute flow over the entire width of the cell. The first cell or series of cells would have flow in one direction. Return flow would be necessary in the second cell or series of cells.

The plants that would be utilized in the wetland would be cattails which are very responsive nutrient sinks. Cattails would be capable of withstanding flooding or dry surface conditions. Particulate sediment is not likely to harm the stem and root structure of these plants.

The size and utilization of the artificial wetland would be determined by the type of lagoon storage system which would be developed. Optimal use of the wetland cells would be in two sets, thereby allowing greater retention times and more flexibility in raising and lowering water levels in each cell. Because of intensive land requirements that may be needed for artificial wetland creation and considerable approval procedures that may be needed, this option will be dropped from consideration.

Water Quality Standards

A proposed section of the Wisconsin Administrative Code (NR 347) addresses standards for hydraulic dredging and are applicable to the deposition of sediments and return water flows.

The standards for the discharge effluent limits are currently determined on a case-by-case basis to allow for variation in sediment characteristics, lake characteristics, and unusual conditions.

Return water effluent limits of 50 milligrams per liter (mg/l) suspended solids and 0.5 mg/l unionized ammonia have been set for recent dredging projects. No water quality standards have been set for this dredging project at this time by the Wisconsin Department of Natural Resources Lake Michigan District.

Disposal Site Investigation

The Wilson Lake area is contained within the western outwash plain and moraine geohydrologic province. Glacial deposits mainly of outwash and end moraines range from 75 feet to 2,000 feet in thickness. Bedrock is sandstone in the south and crystalline rock in the north. Plains and morainal ridges characterize the topography within the area with elevations ranging between 800 feet and 1,300 feet. Over half the soils in this area are loams, sandy loams, and silty loams with moderate infiltration. Another one third of the soils are sand and sandy loam with rapid infiltration. Only a small portion of this area contains silty and clay soils with slow infiltration. Glacial deposits and sandstones in the area yield moderate to large quantities of water when they are generally used for domestic land irrigation. In many areas, average yields exceed 500 gpm. Regional groundwater flow in the area is toward the east southeast toward Lake Poygan. No comprehensive soil survey has been completed for Waushara County.

A field survey of the area around Wilson Lake revealed a number of areas that are relatively flat, and are currently not being used for agricultural purposes.

A site approximately one-half mile north of Wilson Lake has been retained for further evaluation because of its proximity to the lake, availability and low intensity land use.

CHAPTER 5

RECOMMENDED PLAN

Based on the evaluation of several alternatives presented in Chapter 3, Alternative 3 is recommended for implementation. This decision was based on the project costs which are considerably lower than those of the other alternatives while the anticipated results for all alternatives points to a long-term solution to lake problems. This alternative along with other measures that are included in this recommended plan will help satisfy the goals of rehabilitating Wilson Lake as an aesthetic, recreational, and environmental resource and perserve it for enjoyment for future generations.

Wilson Lake would be dredged to specific depths discussed in Chapter 3 and at locations as shown on Figure 4. The sediment will be pumped to a disposal lagoon consisting of a number of individual cells where the suspended material will settle out. Carriage water will pass through a screen to remove any unsettled sediment prior to flowing by gravity through a piping system back to Wilson Lake. Discharge will be over a spillway made from rocks to increase the dissolved oxygen content of the return water flowing to Wilson Lake.

The lagoon will be sized for 225,000 cubic yards of sediment and will include sufficient volume for retention of the carriage water. It is anticipated the lagoon will be set up in a series of cells for sequential pumping to reduce land utilization. The lagoon system area will be 10 to 25 acres for sediment stored ten feet deep. The size of the lagoon may vary depending on retention time needed for carriage water to meet water quality standards. The dike will be constructed to enclose the lagoon as described in Chapter 4 in the section entitled "Disposal Storage."

Proposed Disposal Site

The disposal site for dredged material selected for this project is located approximately one-half mile northwest of Wilson Lake. This site was selected because of its proximity to the lake, low intensity use and current availability. A preliminary survey of the area indicates other sites may be suitable for disposal of dredged material, but they are located farther from the lake. This distance would increase the cost of the dredging operation. It is also not certain whether the other sites would be available for such usage. The selected site has been identified as a potential disposal area in a preliminary survey conducted by the Wisconsin Department of Natural Resources, Office of Inland Lake Renewal. This site is shown on Figure 7.

Access to this site can be gained from 22nd Avenue which abuts the property to the west and from County Trunk Highway A which abuts the property to the north. The site includes two parcels totaling 74 acres. These property owners have indicated they would have no objections to using their land for the disposal of dredged material. Ultimate plans for this site are for recreational usage as a campground. After completion of the project the dredged material remaining in the lagoons would probably be spread over the site and/or transferred to nearby farmers who could use the material as a soil conditioner.

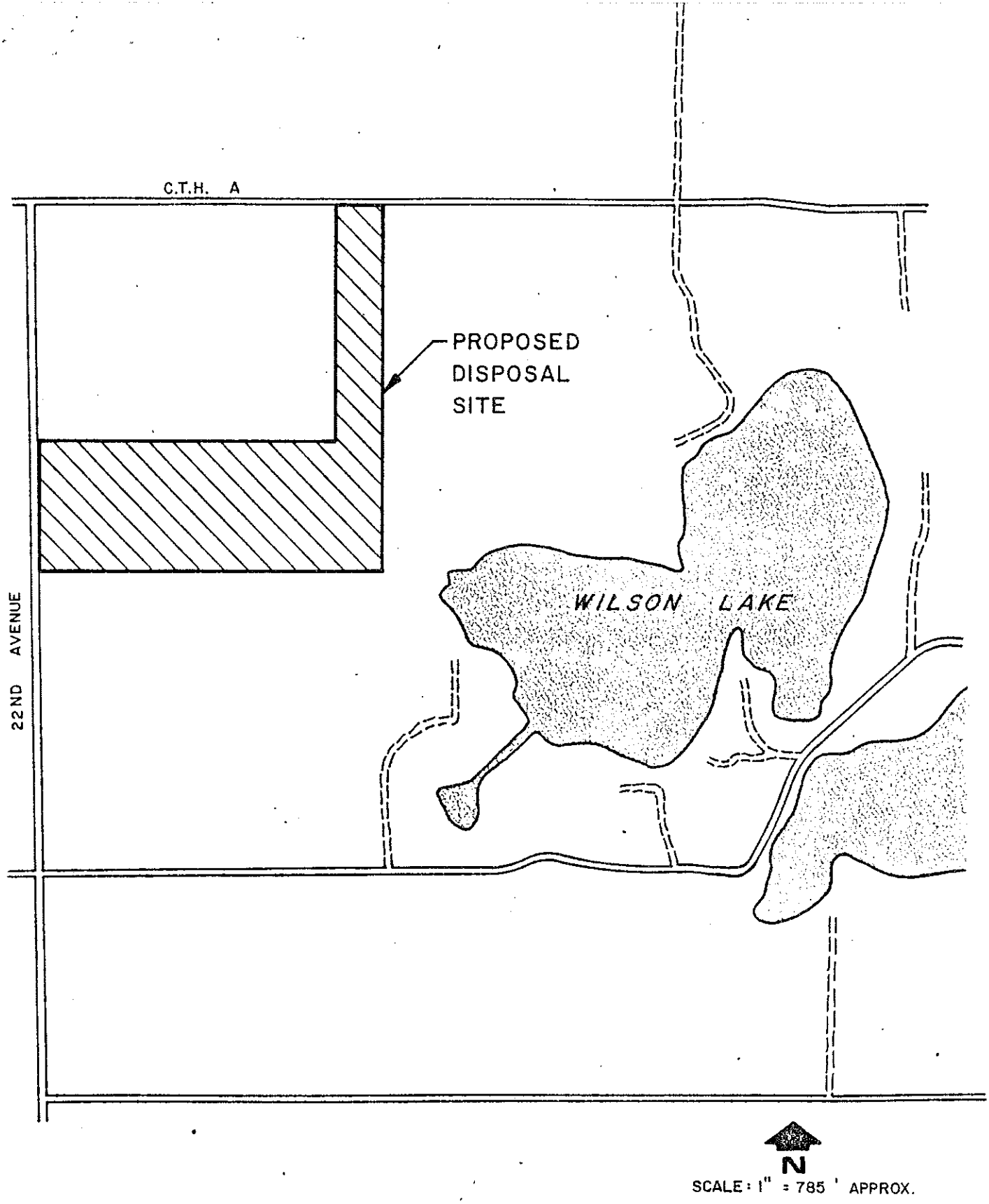

FIGURE 7
PROPOSED DISPOSAL SITE LOCATION
WILSON LAKE, WISCONSIN
DONOHUE & ASSOCIATES, INC.
1980

The site is at an elevation of approximately 890 feet above mean sea level which is approximately 20 feet above the level of Wilson Lake. The site is currently idle land with vegetation consisting primarily of a variety of grasses with scattering of deciduous trees. Slopes are generally less than two percent. The nearest development to the site consists of a residence approximately 1,000 feet north of the site along 22nd Avenue and a residence adjacent to the site on the north side of County Trunk Highway A. It is assumed that both these residences have potable water wells. Because groundwater flows are determined to flow away from these existing wells, the wells should not be impacted by a dredging operation.

Soils information in the area where the lagoon may be constructed indicates the site consists mainly of Plainfield and a small area of Brems series soils. The Plainfield soils are excessively drained and formed in sandy drift on outwash plains, stream terraces, and glaciated uplands. Their depth to bedrock is generally greater than five feet and depth to the water table is generally greater than six feet. The Brems soils are moderately well drained and formed in acid sand on outwash plains. Their depth to bedrock is generally greater than five feet and depth to the water table is generally two to three feet. Location and soils information indicate no problems with flooding at the site.

Watershed Management

Certain measures can be taken to reduce nutrient and sediment loadings to Wilson Lake with minimal or no monetary expenses. In the areas around the Lake, fertilizers on lawns and gardens should be applied wisely avoiding areas and periods of time when runoff may occur. Where possible, fertilizer should be either eliminated or applied at reduced rates. Yard debris such as leaves, grass clippings, and other solid waste should be prevented from being transported in flows during periods of spring or storm runoff. Composting this debris could be beneficial for home usage. Other measures may be taken by local residents where the institution of lake protection measures can be to their benefit. Shoreline protection would be one instance where property owners can take steps to prevent valuable lakeshore areas from being eroded. In agricultural areas of the direct watershed of Wilson Lake, the Lake District should work with local governmental agencies to identify critical nutrient and soil loss areas. These local agencies should work with cooperating land owners to implement best management practices for their land through existing cost sharing programs.

In developing urban areas around Wilson Lake, erosion and construction site runoff could be potential problems to the lake if not controlled. The Lake District should work with local governmental agencies and developers to ensure that proper erosion and sediment control procedures are implemented in these areas.

Weed Harvesting

The dredging plan should considerably reduce the extent of rooted aquatic vegetation in Wilson Lake. However, the problem will not be eliminated. After dredging is completed, the macrophyte population should be continually monitored to detect potential problems. If problems become severe enough to limit recreational activities on the lake, a weed harvesting program should be considered.

Most harvesting programs have been undertaken as a cosmetic approach to lake management. The removal of aquatic plants reduces the potential for this material to decompose and contribute to a sedimentation problem. Nutrient removal can also be a beneficial effect of plant harvesting. Harvested material also has practical uses such as mulch, fertilizer, and fodder.

Mechanical harvesting has been extensively used for controlling nuisance growth of aquatic plants. The initial cost is usually the main drawback when considering mechanical harvesting as a management method. In the Wilson Lake situation, a cooperative agreement may be able to be conceived between Kusel and Round Lakes to share the financial burden. Cost for initial capital investment operation and maintenance could be divided among these three lakes in the District based on anticipated and actual usage.

Environmental Considerations

The recommended plan will have a number of beneficial and adverse impacts. The lake deepening and weed harvesting elements of the recommended plan will provide increased long-term recreational opportunities. The creation of additional habitat for aquatic and terrestrial species should be of benefit both recreationally and environmentally. Any conservation practices implemented in the watershed should lead to better water quality in Wilson Lake. The selected dredging will create areas of improved habitat, thus, significantly increase the diversity of the flora/fauna throughout the lake.

The proposed dredging program will temporarily limit the number of recreational opportunities on the lake. However, after the project is completed, recreational use should be considerably increased. Aquatic species could be adversely impacted by increased turbidity and the benthic community would be disturbed. However, this would be a short-term impact during the dredging operation. Since the dredging plan will avoid spawning areas, natural reproduction should not experience any significant adverse impacts during the dredging operation. Terrestrial species should not experience any significant impacts.

Tentative Cost Estimates

The estimated construction cost for the recommended plan is as follows:

Item	Quantity	Unit Cost	Cost
Dredging	225,000 cu yd	$2.30/cu yd	$517,500

The unit cost for dredging is based on hydraulic pumping of the sediment. The $2.30/cubic yard cost also includes moving in and setting up of the dredge; site preparation for the lagoon; piping to pump the sediment to a distance no greater than one-half mile; and shutdown and cleanup. Costs for easements at the disposal site are not included as this will be negotiated between the Lake District and property owners at a later date.

The estimated engineering fee for design and construction related services is as follows:

Design engineering including plan and specification preparation, bidding, preliminary land disposal location recommendations, horizontal and vertical control, and permit preparation is in the range of $50,000 to $60,000. Construction related services including contract administration and staking is in the range of $37,000 to $47,000. These estimates do not include costs for a monitoring program, soil borings, or additional surveys that will be required by the WDNR at a later date.

Tentative Design and Construction Schedule

This schedule is contingent on Lake District and management plan approval by the appropriate agencies. Approvals for financial assistance and permits and proposed legislation governing hydraulic dredging projects (NR 347) may require this schedule to be modified.

November, 1980	-	Conduct sediment sampling program
December 1, 1980	-	Submit the Lake Management Plan to DNR
March 15, 1981	-	Preliminary design completed
March 30, 1981	-	Final design completed
April, 1981	-	Permits requested from review agencies
May, 1981	-	Advertise for bids
July, 1981	-	Open bids and recommend award of the contract
August, 1981	-	Commence construction
September, 1981	-	Commence hydraulic dredging
September, 1983	-	Construction finished

CHAPTER 6

IMPLEMENTATION FRAMEWORK

Permit Process

A dredging project at Wilson Lake will require approvals of local, state, and federal governmental agencies. Existing zoning on the property proposed for the disposal site is agricultural. According to the Waushara County Zoning Administrator, a dredged material disposal lagoon would be a permitted use in this district.

At the state level, a permit for the authority to remove materials from the bed of a navigable waterway will be required in accordance with the provisions of Section 30.20 of the Wisconsin State Statutes. This permit would be issued by the Wisconsin Department of Natural Resources, Green Bay District Office (WDNR-GB).

Following a submission of the lake management plan to the Wisconsin Department of Natural Resoures, other reviews, approvals, and permits may be necessary. The proposed plan will be sent to the Waushara County Soil and Conservation District and the East Central Wisconsin Regional Planning Commission for review. The Wisconsin Department of Natural Resources will conduct an environmental screening to determine if an environmental impact statement (EIS) will be required for this project.

The Wisconsin Department of Natural Resources Bureau of Solid Waste will review the proposed plan and determine whether the proposed disposal site will have to be a licensed landfill or whether an exemption can be granted based on NR 180 of the Wisconsin Administrative Code.

The return carriage water from the disposal site will have to conform with water quality standards set by the Wisconsin Department of Natural Resources in accordance with the Wisconsin Pollutant Discharge Elimination System (WPDES).

The U. S. Army Corps of Engineers may require a permit for dredging or filling in accordance with Section 404 of the Clean Water Act of 1977. The Corps may grant approval of the project after review of the proposed plan or require a 404 permit be prepared. The U.S. Fish and Wildlife Service and the Environmental Protection Agency may also be asked to comment on the plan.

Funding Sources

The dredging and disposal of material from Wilson Lake will almost certainly require financial assistance from governmental agencies. The Kusel, Wilson, and Round Protection and Rehabilitation District would be eligible for funding under a cost sharing program for implementation of the Lake Management Plan from the Wisconsin Department of Natural Resources, Office of Inland Lake Renewal. The maximum level of funding for any single project is ten percent of the total grants available in any given year. The expected level of funding for fiscal 1980, which ends of in June of 1981, will be in the range

of $210,000 to $225,000. Because of the high cost of this dredging project, funding through the Clean Lakes Program of the Clean Water Act (Section 314 of PL 92-500) is likely to be recommended by the Office of Inland Lake Renewal. Funding under this program is available from the U.S. Environmental Protection Agency (EPA) on a cost sharing basis of 50 percent federal to 50 percent matching state and/or local aid. No limits have been set for the amount of available funding for specific projects. Future funding levels for Region V, in which Wilson Lake is contained, are not known. These projects must be approved by the Soil and Water Conservation District, Regional Planning Commission, Office of Inland Lake Renewal, EPA, and a technical panel before funds can be dispersed.

Part or all of the local share of an implementation project may be defrayed by nonmonetary aid, volunteer work, and materials provided by individuals and organizations such as community and civic groups. The local share can also be raised through taxes, contributions, fishing contests, or similar fund raising events. Although the Office of Inland Lake Renewal funding and EPA 314 Clean Lakes Program are the two main nonlocal funding sources, other funding programs could be combined to implement the recommended plan provided it is watershed work not related to the inlake dredging program. Such funding sources may include the Wisconsin Fund, Section 208 of PL 92-500, and a number of programs available through the local Soil and Water Conservation District and Agricultural Stabilization and Conservation Service. These programs provide funding for institution of agricultural conservation practices and other nonpoint source pollution controls.

Monitoring Program

Before the final Wilson Lake Management Plan is submitted to the Office of Inland Lake Renewal some sediment analysis must be conducted. This analysis must include the following parameters: pH, percent sand, silt and clay; percent solids; total Kjeldahl nitrogen; ammonia nitrogen; total phosphorus; cadmium; and chromium. It is not anticipated that these analyses will reveal any problems with the composition of bottom sediments. If problems would arise, the WDNR may require additional sediment analyses.

If a dredging project is to be implemented at Wilson Lake the WDNR-GB district office will set certain water quality standards for this project and require a monitoring program be conducted before, during and after the project.

Project Administration

The Kusel, Wilson, and Round Protection and Rehabilitation District was established in September, 1974. Pursuant to Chapter 33 of the Wisconsin State Statutes, the Lake District includes the entire shoreline of these three lakes and adjacent areas.

The District was empowered to the extent provided in Chapter 33 of the Wisconsin State Statutes to develop and conduct rehabilitation projects and has bonding and taxing authority. Improvements at Wilson Lake would only involve local funds from the property owners in the Wilson Lake portion of the Lake District. The District has the ultimate authority for administering the lake protection and rehabilitation project. The exact administrative format

that will be utilized has not yet been determined. The implementation program will need a lead person or group to assume major responsibility for such areas as contract bidding, project supervision, contract compliance, financial management and reporting.

Citizen Participation Program

Before the implementation of a lake management plan is undertaken at Wilson Lake, a public awareness program should be developed to inform, educate and seek local participation in an effort to improve the quality of the lake. This awareness can be accomplished through public meetings, news releases, informational brochures, films and private discussions. The purpose of the citizens involvement program is to attain cooperation and support of private citizens, civic organizations and governmental agencies. The overall support of the general public is vital to a successful effort to attain the goals and objectives set for this project.