CHAPTER 1- EXECUTIVE SUMMARY

The purpose of this report is to address the feasibility of removing sediment from the Belle Isle Channels (channels) comprised of Lagoon du Nord, Lagoon du Sud and the Sumac channels. These channels have been filling in slowly over many years. Currently, motorboat access is difficult due to depths less than three feet in many locations. Recreational use (fishing, swimming, paddle sports) and aesthetic value of the channels have also decreased in recent years due to the channels filling in with sediment.

The source of sediment in these channels include:

- Stormwater runoff-15 storm sewer pipes from a 205-acre drainage area,
- Lake Bottom Sediment Transport- from the prevailing southwest to northeast wind direction on Lake Monona, and
- Organic Decomposition- from weed cutting and floating leaves.

Sediment traps and breakwater structures can be installed to control the sediment source in the future.

The feasible sediment removal volume for these channels is a function of depth since the channel width and length are fixed. Several limiting factors controlling the depth include:

- Side Slopes- steepness depending on bank soil,
- Buried Utilities- cannot remove sediment below utilities unless the utilities are deepened, and
- Grant Funding- will only fund up to 6 feet depth.

In consideration of the limiting factors, two alternatives were considered for sediment removal depth:

- Alternative #1 - Remove sediment to 839.6 elevation with a 3:1 side slopes, or
- Alternative #2- Remove sediment to 837.9 with a 2:1 side slopes.

The cost range for these alternatives are from $150,000 for Alternative #1 to $300,000 for Alternative #2.

As part of the overall project, a floating dock could be installed at the Winnequah Rd crossing on the Sumac Channel. Fish enhancement structures are not recommended on the channel bottoms. However, removing sediment at uneven levels will enhance fish habitat.

Hydraulic dredging is recommended as the sediment removal method. The sediment would be piped to a de-watering basin at Oneida Park or City land north of the Winnequah Rd baseball fields.

Potential funding sources for this project include the WDNR Recreational Boating Facility (RBF) grant (50% cost-share), Fish-America grant ($20,000) and other smaller grants. An individual Chapter 30 permit is needed from the WDNR prior to sediment removal.

At the direction of the City council, the scope of the dredging feasibility study was expanded to include consideration of sediment removed from the lagoon north of Winnequah Road to Nichols Road. Using the same two alternatives (listed above), the total sediment removal cost ranges from $280,000 for alternative #1 to $500,000 for alternative #2 if this additional area was dredged. Alternative #2 would involve removing consolidated sediment from the channel above Winnequah.

The feasibility of replacing the culvert at Winnequah Road with a larger bridge capable of passing boats underneath it was also analyzed. The cost to install an 8-foot high by 10-foot wide concrete box culvert is estimated at $261,000 including road replacement and fill needed to elevate the roadway.

CHAPTER 2- INTRODUCTION AND BACKGROUND

The purpose of this report is to address the feasibility of removing sediment from the Belle Isle Channels (channels) comprised of Lagoon du Nord, Lagoon du Sud and the Sumac channels. The purpose of this chapter is to describe the project location, problems associated with channel sedimentation, past restoration activities and critical channel elevations in the channels.

a. Project Location

The location of these channels is shown in Figure 1, 2 and 3. Pictures of the channels are shown in Figures 4a-k . These channels are located on the southeastern end of Lake Monona. Lake Monona is approximately 3274 acres in size and is part of the Yahara River chain of lakes. The lake provides fish and wildlife habitat, flood protection and recreational opportunities for local residents and an international community of visitors. Recreational use of Lake Monona is intense, with boaters, water skiers, sail boaters, wind surfers, anglers and swimmers taking advantage of the lake's attributes. The lake has a diverse fishery of perch, panfish, largemouth bass, northern pike, walleye and muskellunge. However, a fish consumption advisory exists for certain fish in the lake.

The channels provide access to the lake for riparian landowners and a large number of non-riparian residents. The linear dimensions of these channels are:

- Lagoon Du Nord (Nord)- 1280 feet long, 50 feet wide and 2 to 4 feet deep,
- Lagoon Du Sud (Sud)- 1000 feet long, 60 feet wide and 3 to 5 feet deep,
- Sumac Channel (Sumac)- 1180 feet long, 35-40 feet wide and 2 to 4 feet deep.

b. Channel Sedimentation Problems

These channels have been filling in slowly over many years. Currently, motorboat access is difficult due to the shallow conditions. A typical motorboat needs a 3 feet depth to allow the inboard motor to function without hitting the bottom and damaging the propeller. Many depths in the Nord and Sud channels are now less than 3 feet with many portions of Sumac less than 2 feet.

Fishing opportunities in the channels have declined in recent years due to the shallow depths. The channels provide fish habitat during the early spring months when the lake is too cold to support them. The protected channels heat up quicker than the lake and fishing is excellent until the channels overheat in the summer months and the fish vacate to the cooler lake water. During the spring and early summer, approximately 6 fishermen per weekday and 12 fishermen per weekend day use the public access points at the end of Pocahontas Drive, Nishishin Trail and Winnequah Road for on-shore fishing. Fishermen also troll the channels from boats to catch fish. Approximately 12 fisherman per weekday and 36 fisherman per weekend day troll these channels from boats during the early summer and spring. (These estimates are provided by a landowner with property along the entrance to the Nord channel.)

Due to the sheltered, calm water, the channels are also heavily used by kayakers and canoeists (paddle sports). One of the Belle Isle residents is a world-class kayaker and offers lessons from his house weekly on the channels. Approximately 6 paddle sport

Figure 4a- Sumac Channel- Looking North to Winnequah Road

Figure 4b- Sumac Channel- Looking South to Lagoon du Nord

Figure 4c- Sumac Channel Bulkhead

Figure 4d- Sumac Channel- Looking South to Lagoon du Nord

Figure 4e- Sumac Channel Midway- Looking North

Figure 4f- Sumac Channel Midway –Looking South

Figure 4g- Sumac Channel – at South End Looking to Confluence with Lagoon Du Nord

Figure 4h- Lagoon du Nord –at Bridge looking East

Figure 4i- Lagoon du Nord Bridge- Looking East from channel

Figure 4j- Lagoon du Nord Bridge

Figure 4k- Lagoon Du Sud Channel-Looking east from Bridge enthusiasts per weekday and 12 paddle sports enthusiasts per weekend day use these channels.

Due to the large floods in 1997, 1998, 2000 and 2004, these channels have become more rapidly filled in with sediment. As the recreational opportunities have diminished, the residents of Belle Isle have become more vocal in describing these problems to the city. A listing of local support letters and petitions is shown in Appendix – and a newspaper article describing the current condition.

The channel sediment deposition has created a number of problems:

- Reduced fish habitat during summer months- In telephone conversations with Kurt Welke, fisheries biologist for the WDNR, he indicated that these channels serve an important function to the fish population by providing a warm area for them to reside in the spring while the lake slowly warms. However, in the summer, these channel become overheated and the fish leave for the cooler waters of the lake. By excavating foreign material from the channel bottom, the channels will remain cooler and continue to provide fish habitat longer into the summer. Excavating down to the courser sediment may also improve fish habitat.
- Reduced recreational opportunities for paddle sport enthusiasts- As described above, these channels are heavily used by canoeists and kayakers. However, due to the reduced depth caused by sedimentation, the kayakers rudder (skag) and canoeists keel hits the bottom and they cannot access the channel. In addition, the paddle of the kayakers/canoeists cannot be used due to the shallow depths. Many paddle sport enthusiasts from areas other than Belle Isle have signed petitions and a letter of support from Rutabaga is included in Appendix A to document these problems.
- Excessive algae growth in the channel- As the channel depths have become increasingly shallow, the algae and weed growth has increased. Abundant rooted aquatic plant growth has historically occurred in Lake Monona, particularly in Monona Bay and Turville Bay. As depths have decreased in the channel, rooted plant growth has increased. Eurasian water milfoil (*Myriophyllum spicatum*), a non-native aquatic plant having less fisheries value than native plants, invaded the lake in the last 50 years and is now common in the channel.

In August of 2005, The City of Monona, in response to the local concerns, applied for a WDNR Lake Planning grant to address the feasibility of restoring these channels by removing accumulated foreign materials, install a floating dock, and adding fish enhancement structures to the channel bottom.

c. Past Restoration Activities

The channels were created circa 1911-12 when the Belle Isle area was surveyed in 1912 by Ray Owen (See Appendix B). An early aerial photograph from the 1930's clearly shows the Nord and Sud Channels and the Sumac channel extending north and ending at Winnequah Rd.

None of the early records or drawings concerning the depths of the original channels can be located. Based on conversations with residents having lived here since 1951, the channels were dredged in 1949 with the dredging spoil material used to create the baseball diamonds north of Winnequah Road. (Narrative correspondence with LaBelle).

In September of 1968, the Sumac Channel was extended from Winnequah Road to Nichols Road creating the Interlake Lagoon area. No design plans or channel depths were found for this project.

In 1978, the Sumac channel was dredged from Winnequah Road to 80 feet south of Winnequah Road with approximately 2 feet of sediment removed to a 4 foot channel depth.

In 1984, the Nord and Sud bridges were repaired and resurfaced with driven piles 55 feet deep.

d. Channel and Utility Depths

Research concerning past channel bottom elevations yielded little infomation. A 1969 water main crossing of the Nord bridge shows a channel elevation of -5.5 ft City datum while the 1984 Bridge plans show a -6 ft elevation at both the Nord and Sud bridges.

Based on narrative correspondence with older Belle Isle residents, the channel depths remained from 5.0 to 6.0 feet deep through the 1980's. One resident remembers diving from the Sud bridge in the 1968 and also diving from a swimming platform on the Sud Channel. This information is confirmed by both the 1978 Sumac dredge plans and the 1984 bridge plans which show a 4 foot Sumac depth and a 4.9 foot depth at both bridges.

Sanitary, water main and gas utility pipes cross underneath the Nord and Sud channel in siphons at the bridge locations. The elevation of the water main siphon is at -8.9 feet while the sanitary pipe is at –6.9 (Nord) and -7.2 feet (Sud) (See Appendix C). The gas line crossing at both bridges is much deeper-approximately 20 to 30 feet below the channel bottom.

This project involved surveying both hard and soft channel bottom elevations at several locations along the Nord, Sud and Sumac channels. The survey results are shown in Appendix D and summarized below:

TABLE 1- Existing Surveyed Hard and Soft Channel Bed Elevations

Station	Station Location	Max Soft Channel Elevation (City Datum)	Average Soft Channel Elevation (City Datum)	Average Soft Channel Depth (from Summer Minimum Lake elevation) (ft)	Max Soft Channel Depth (from Summer Minimum Lake elevation) (ft)
Nord-1	@ West side of bridge	-4.97	-3.59	2.52	3.91
Nord-2	@ East side of	-4.97	-3.84	2.47	3.61

	bridge				
Nord-3	@ East end of channel	-5.08	-4.18	3.21	4.11
Nord-4	@ West end of channel	-4.99	-4.53	2.11	2.61
Sud-1	@ East end of channel	-7.16	-6.57	4.36	5.01
Sud-2	@ East side of bridge	-5.21	-4.74	3.04	3.51
Sud-3	@ West end of channel	-6.83	-5.84	3.01	3.61
Sumac-1	90 feet South of Winnequah Rd crossing	-3.78	-3.52	2.31	2.75
Sumac-2	360 feet upstream (North) of Sumac -3	-3.51	-3.59	2.11	2.45
Sumac-3	370 feet upstream (North) of Sumac-4	-3.76	-3.41	2.12	2.65
Sumac-4	45 ft upstream (North) of confluence w/ Nord	-4.22	-3.76	2.48	3.05

Table 1 demonstrates the extent which the channels have filled in since 1984. A 3 foot clearance is needed between the water surface and channel bottom for motor boat access to prevent engine damage. In many places, the clearance is much less than 3 feet including the entire Sumac Channel and the west end of Lagoon du Nord.

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CHAPTER 3 – SEDIMENT SOURCE AND CONTROL

The purpose of this chapter is to determine the source of the sediment in the channels and to recommend improvements which control the future sediment loading from these sources. As described in Chapter 2, these channels have not been dredged since 1949 and have slowly become filled with sediment throughout the years. This sediment deposition has transformed a swimmable, fishing, recreational channel into an inaccessible, shallow ditch. If the source of the sediment is not addressed and controlled, the channels will continue to fill up rapidly and dredging will need to occur more frequently.

a. Sediment Sources

The source of sediment in these channels include:

a. Stormwater runoff- The drainage area for this area is approximately 205 acres including the Interlake Lagoon area as shown in Appendix F. 15 storm sewer pipes from 12 inch to 24 inch diameter drain to the lagoon at various outfall points. This stormwater drainage contains suspended sediment which settles out of the stormwater once in the lagoon. Eventually this sediment ends up in the Sumac and Lagoon du Nord channels. A picture of the excessive sediment at the Winnequah Outfall is shown in Figure 5. The sedimentation caused by stormwater runoff is a reason that the Sumac Channel has higher sediment levels than the Nord or Sud channel.

b. Lake Bottom Sediment Transport- Another source of sediment is the accumulated sediment on the bottom of Lake Mendota. This lakebed sediment is transported by the lake current which blows in a predominately southwest to northeast direction. This current pushes the sediment to the west edge of the Nord and Sud channels. The current in the channels is predominately west to east and the sediment is carried along with the current. The Lake bottom sediment is the reason that the west end of the Nord Channel is the most filled in of the Nord and Sud channels.

c. Weed- cutting debris- The County weed-cutting machine actively cuts weeds in the Lake during the summer months. Although the machine picks up some of the cut weeds, a potion of the weeds floats away. Debris from the weed cutting machine is pushed by the surface current to the west edge of the channels. Eventually, this weed material decomposes and contributes to the sediment on the bottom of the channels. Long-time channel residents have seen the floating weed debris float through the channels when they were deeper. However, due to the shallow depths, the floating weeds have hung up and decomposed rather than floating through.

d. Organic decomposition (leaves, etc)- The leaves of the many trees also fall directly on the channels and decompose adding to the organic sediment on the bottom.

Figure 5- Sediment Buildup at Winnequah Road Culvert outlet

Of these sources, stormwater runoff is the primary sediment source in the Sumac Channel while lake bottom sediment is the primary source in the Nord and Sud channel (particularly in the West end).

b. Sediment Control Structures

The following control structures are proposed to control future sediment transport into the channels:

a. Breakwater- A breakwater structure consisting of submerged rocks could be placed outside the western entrance to the Nord and Sud channels. These rocks would form a barrier to the migrating lake bottom sediment. Breakwater structures have been used by the City of Madison to protect harbor and boat landing areas on Lake Monona.
b. Concrete bottom sediment trap- A sediment trap could be constructed on the Sumac channel. This trap would have an entrance ramp to allow for easy access for vehicles to remove sediment. This trap could be installed near the Winnequah Road outlet pipe –either on the upstream or downstream side. A schematic drawing of this trap is shown in Figure 6 a-b. Pictures of a sediment trap are shown in Figure 7 a-d.
c. Reduce sediment inflow at sources in Monona upstream of the Interlake Lagoon. By reducing the sediment inflow into the Interlake Lagoon, the need to dredge in the Sumac and Nord channels will be eventually reduced. Although this is a long-term goal, Monona does have a stormwater permit which will require a 20% reduction in sediment loading by 2008 and a 40% reduction by 2013.This permit requirement will possibly require the installation of sediment control measures upstream.

Figure 7a- Concrete lined Sediment Trap- Side View

Figure 7b- Concrete lined Sediment Trap- Front View

Figure 7c- Concrete lined Sediment Trap- Front View

Figure 7d- Concrete lined Sediment Trap- Side View

CHAPTER 4- SEDIMENT REMOVAL VOLUME

The purpose of this chapter is to determine the approximate volume of sediment that can feasibly be removed from these channels. As described in Chapter 2, limited information was available concerning past channel depths or dredging activities. The depth of dredging is the driving factor in determining volumes since the width of these channels is fixed. Several limiting factors were analyzed concerning dredging depths:

- Side Slopes- The channel top widths are between 35 ft wide (Sumac) and 55 to 65 feet wide (Nord and Sud). Most of the channel frontage has a natural bank without any retaining walls. The side slopes needed to achieve greater dredging depths can be steeper than normal particularly on the Sumac Channel. A 3H to 1 V side slope is a typical side slope for many dredging projects. A 2H to 1V side slope is feasible for certain sites. An important parameter to determine how steep the side slopes can be without sloughing or structural failure is the sediment bank composition. If the bank is comprised of a soft, organic, plastic soil , steeper side slopes may not be feasible. However, a sandy, stiff sediment bank can be cut to a steeper side slope. A detailed slope stability analysis is recommended by a geotechnical engineer prior to any sediment removal work.

  Installing vertical bulkhead walls along the shoreline would also increase the amount of dredging width and volume. Some landowners along the Sumac Channel have already installed these vertical walls. However, for bulkhead walls to function to increase the dredging width and depth, every property would need a bulkhead wall. Cost estimates for bulkhead walls are from $20,000 to $40,000 per property depending on the soil conditions, type of bulkhead wall and local site access conditions. Examples of residential bulkhead walls are shown in Appendix E.

  As noted in other reports, the Belle Isle area is a chronically flooded area. Within the past ten years, the residents have experienced structural flooding four times. The bulkhead walls, described above, could also serve a flood control purpose. The Federal Emergency Management Agency (FEMA) issues Pre-Disaster Mitigation (PDM) grants to finance 75%- 87.5% of flood control improvement projects. The City of Monona has already applied for a PDM grant to install two lift stations on the Nord and Sud channel to mitigate flooding. The bulkhead walls, proposed above, have multiple benefits associated with them:

  - Dredging Volume Increase- by allowing the dredging to go deeper and wider due to the vertical control of sediment caused by the walls, and
  - Flood Control Benefit – by constructing the top of the bulkhead wall to be above the 100-year floodplain elevation of Lake Monona.

- Utility Conflicts- Another limiting factor is the sanitary and water main crossing of both the Nord and Sud bridges. The utilities were buried under the water surface in a siphon when the bridges were rebuilt in 1983. The sanitary sewer siphon was installed 6 inches below the channel bottom. To dredge deeper than the utilities would require moving the utilities to a deeper level.

- Recreational Boating Facility (RBF) grant- The RBF grant can be used to finance 50% of a dredging project (see Chapter 10 for more explanation). The RBF grant can be used for dredging to a depth of 6 feet. The elevation of 6 feet depth in the channels is 839.7 USGS elevation. (6 feet from the Summer Minimum Lake level for Monona)

- Existing Docks/Piers extending into the channel- As shown in the channel photographs in Chapter 2, many channel residents have constructed docks which extend into the channel. These docks have foundation circular wood pilings sunk into the bottom of the channel. Information on the piling depths should be obtained before dredging occurs so that the pilings are not exposed during dredging. In general, the dredging operation can work around the dock pilings as long as 17 feet exists between docks (on either side of the channel). They typically leave a 6 foot buffer around the pilings and over excavate around the buffer to account for this. Shore stations and other self-supporting equipment must be removed during the dredging operation. In addition, all known cables in the channel bottom should be removed.

In consideration of the limiting factors described above, two alternatives were considered for sediment removal depths, volumes and side slopes as described below and shown on the preliminary plans in Appendix D:

- Alternative #1 - Remove sediment to 839.6 elevation with a 3:1 side slopes- This alternative is a minimum alternative in that the 839.6 elevation would not require utility relocation at both the Nord and Sud bridge and uses a more typical 3:1 side slope. In addition, funding from the RBF grant would pay for 50% of the total dredging cost.
- Alternative #2- Remove sediment to 837.9 with a 2:1 side slopes- This alternative , as described above, has a number of concerns:
    - the sanitary sewer siphon would need to be lowered,
    - a slope-stability analysis would need to be performed on the channel banks to determine if the steeper 2:1 slope is stable, and
    - the City would need to pay the additional depths below 6 feet without the RBF grant.

However, the depths would be deeper so that the dredging would last longer and the channels would be swimmable and divable with an approximate 7 foot depth.

The dredging depths, volumes and dewatering areas associated with these two alternatives are shown in Table 2 below.

TABLE 2 – Sediment Removal Depths and Volumes

Alternative	Depth (Ft)	Volume (CY)	Dewatering Area Reqd (Acre) w 6 ft berms
#1	**5.1**	**7100**	**1.5**
#2	**6.8**	**17000**	**3.5**

Opinions of probable cost to deepen the sanitary siphon at the Nord and Sud bridge range from $75,000 to $100,000 per utility siphon relocation. (Henshue Construction)

CHAPTER 5- COURTESY PIER AT WINNEQUAH RD

As part of this feasibility study, the placement of a floating dock at the downstream, south side of the Winnequah Road culvert crossing was investigated. A city parking lot is located at this site. The dock would be approximately 8 feet wide and 20 feet long. A portable restroom or bait vending machine could be placed here. This dock would provide fisherman with a safe place to fish from the shore and also provide a courtesy location for people to use the restroom once on the lake.

The lot on the southeast corner of the Winnequah bridge is owned by the City of Monona. In conversations with the owner of Rutabaga, he has agreed to finance the construction of a shelter structure to assist people in changing clothes and kayak unloading. The WDNR has a sport-fishing dock program which would fund 100% of the cost to install a pier. Access to this lot would be by an ADA accessible ramp from the Winnequah Road parking lot. Pictures of docks are shown in Figure 8.

CHAPTER 6- SEDIMENT REMOVAL METHOD

The purpose of this chapter is to describe the different techniques available to remove sediment. Dredging can be of two types- either mechanical or hydraulic. The choice of which method is determined by a number of factors including:

- Chemical constituency of soil- If a chemical analysis shows toxic material in the dredge material then mechanical dredging is needed to transport the material to a landfill.
- Location of nearby dewatering site- If a site is located close to the dredging which is open and suitable for dewatering, hydraulic dredging is possible. These sites should be 3000 feet or closer to the dredging site to avoid expensive pumping costs.
- Barge accessibility- Mechanical dredging is often performed by a dragline and the dredge material loaded on a barge. Barges cannot enter a small channel with little bottom clearance. However, Kori amphibious excavators can remove sediment from extremely shallow channels and load the barge out in the deeper water of a lake. These excavators are used to dredge swamps in the southeastern part of the country.

Channel bottom sediment was analyzed at a state laboratory for various organic and inorganic parameters as described in Chapter . Based on the analytical results, the WDNR has determined that the sediment can be disposed on-site. (See Appendix 4). Several on-site disposal sites exist as describe in Chapter 9.

Based on the location of several disposal sites close to the project and the suitability for on-site disposal, hydraulic dredging was selected to remove sediment and restore these channels.

Pictures of hydraulic dredging are shown in Figure ___. Several dredging contractors were contacted to obtain a preliminary cost estimate for hydraulic dredging. These contractors estimated the mobilization cost and de-mobilization cost to be between $10,000 to $45,000 (depending on the size of the dredge used). A 10-inch discharge line will pump 5000 to 6000 gallons per minute while an 8-inch discharge will pump between 2600 to 2700 gpm. The estimate for dredging ranged from $6 to $9 per cubic yard of sediment. Both contractors' estimates ranged from __ to ___ with one charging less per cubic yard and more to set up while the other charged less to set up and more per cubic yard.

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CHAPTER 7- Floating Dock at Winnequah Rd Parking lot

As part of this feasibility study, the placement of a floating dock at the downstream, south side of the Winnequah Road culvert crossingb was investigated. A city parking lots is located at this site as shown in Figure __. The dock would be approximately 8 feet wide and 20 feet long. A portable restroom or bait vending machine could be placed here. This dock would provide fisherman with a safe place to fish from the shore and also provide a courtesy location for people to use the restroom once on the lake.

The lot on the southeast corner of the Winnequah bridge is owned by the City of Monona. In conversations with the owner of Rutabaga, he has agreed to finace the construction of a shelter structure to assist people in changing clothes and kayak unloading. The WDNR has a sport-fishing dock program which would fund 100% of the cost to install a pier. Access to this lot would be by an ADA accessible ramp from the Winnequah Road parking lot . Pictures of docks are shown in Figure __.

CHAPTER 8- SEDIMENT REMOVAL METHOD AND COST

The purpose of this chapter is to describe the different techniques available to remove sediment. Dredging can be of two types- either mechanical or hydraulic. The choice of which method is determined by a number of factors including:

- Chemical constituency of soil- If a chemical analysis shows toxic material in the dredge material then mechanical dredging is needed to transport the material to a landfill.
- Location of nearby dewatering site- If a site is located close to the dredging which is open and suitable for dewatering, hydraulic dredging is possible. These sites should be 3000 feet or closer to the dredging site to avoid expensive pumping costs.
- Barge accessibility- Mechanical dredging is often performed by a dragline and the dredge material loaded on a barge. Barges cannot enter a small channel with little bottom clearance. However, Kori amphibious excavators can remove sediment from extremely shallow channels and load the barge out in the deeper water of a lake. These excavators are used to dredge swamps in the southeastern part of the country.

Channel bottom sediment was analyzed at a state laboratory for various organic and inorganic parameters as described in Chapter 7. On-site disposal is allowable for the channel bottom sediment.

A nearby disposal site is Oneida Park. This triangular lot is approximately 2 acres in size within 3000 feet of the channel. Another disposal site within 3000 feet is the public lands along Healy Street between the ball diamonds and the parking lot. These two potential disposal areas are shown in Figure 9 a- d.

Based on the location of several disposal sites close to the project and the suitability for on-site disposal, hydraulic dredging was selected to remove sediment and restore these channels.

Pictures of hydraulic dredging are shown in Figure 10 a-c. Several dredging contractors were contacted to obtain a preliminary cost estimate for hydraulic dredging. These contractors estimated the mobilization cost and de-mobilization cost to be between $10,000 to $45,000 (depending on the size of the dredge used). A 10-inch discharge line will pump 5000 to 6000 gallons per minute while an 8-inch discharge will pump between 2600 to 2700 gpm. The estimate for dredging ranged from $6 to $9 per cubic yard of sediment. Both contractors' estimates ranged from $11 to $14 with one charging less per cubic yard and more to set up while the other charged less to set up and more per cubic yard.

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Figure 9 c- Oneida Park

Figure 9 d- Oneida Park

CHAPTER 9- FUNDING SOURCES FOR SEDIMENT REMOVAL

A number of funding sources exist for this project including the:

Recreational boating facility grant- The Recreational Boating Facilities program, authorized under section 30.92 of the Wisconsin Statutes encourages the development of recreational boating facilities and related activities by providing cost sharing assistance to municipalities. The city could receive a grant for 50% of the cost of dredging .

An integral portion of these grants is that the project provides or improves public access to lakes and motorboat travel. Dredging of a channel of a waterway is covered under the grant to the degree necessary to accommodate recreational watercraft. Eligible costs include engineering, soil borings, dredging and mobilization; construction of a temporary holding area; and transportation of dredge spoils. The RBF grant application must be submitted and presented to the Waterway Commission which meets quarterly. The chapter 30 permit must be obtained before the grant presentation to the Waterways Commission. The RBF grant can only be used for dredging purposes by a municipality once every ten years.

Fish America Foundation grant- The Fish America foundation unites the sport-fishing industry with conservation groups, government natural resource agencies, corporations and charitable foundations to invest in fish and habitat conservation and research across the country. The Fish America foundation has grown over the years and now provides nearly $1 million in matching grants each year to community partners, supporting conservation projects in all 50 states. Over the last twenty years, Fish America provided more than $6 million for more than 750 grass roots conservation projects nationwide. 66 fish restoration projects were funded in Wisconsin ranging from $2,000 to $20,000.

Sport Fish Restoration Grant- The Federal Aid in Sport Fish Restoration Act provides a funding source for management, conservation and restoration of fishery resources. The Sport Fish Restoration program is funded by revenues collected from the manufacturers of fishing rods, reels, creels, lures, flies and artificial baits through an excise tax to the US Treasury. Appropriate state agencies are the only entities eligible to receive grant funds. Each state’s share is based 60% on its licensed anglers and 40% on its land and water area. No state receives more than 55% or less than 1%. The program is a cost-reimbursement program where the state covers the full amount of an approved project and then applies for reimbursement through Federal Aid for up to 75% of the project expenses.

EPA Clean Lakes Program under Section 319 grants - Clean Water Act Section 319(h) funds are provided only to designated state and tribal agencies to implement their approved nonpoint source management programs. State and tribal nonpoint source programs include a variety of components, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulatory programs. Each year, EPA awards Section 319(h) funds to states in accordance with a state-by-state allocation formula that EPA has developed in consultation with the states.

The May 1996 guidance states that "(s)ection 319 funds should not be used for in-lake work, such as aquatic macrophyte harvesting or dredging, unless the sources of pollution have been addressed sufficiently to assure that the pollution remediated will not occur."

Restrictions were put on in-lake work such as aquatic macrophyte harvesting and dredging due to concerns that the sources of the pollution need to be addressed first and also due to cost considerations.

National Fish and Wildlife Foundation grants-The National Fish and Wildlife Foundation operates a conservation grants program that awards matching grants, on a competitive basis, to eligible grant recipients, including federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Project proposals are received on a year-round, revolving basis with two decision cycles per year. Grants typically range from $10,000-$150,000, based upon need. Matching grants are awarded to projects that:

- Address priority actions promoting fish and wildlife conservation and the habitats on which they depend;
- Work proactively to involve other conservation and community interests;
- Leverage available funding; and
- Evaluate project outcomes.

A number of other payment options exist:

Local landowners- The landowners with lots abutting the channel and lakeshore could be assessed a portion of the dredging cost. Although all of the city residents will benefit from dredging the boat landing, the dredging of the channel will primarily benefit the local property owners.

Dane County- Dane County is responsible for controlling erosion control and sediment transport within the Yahara Lakes watershed. Since the Lake bottom sediment originates from areas outside of the City, the County should be participate in the cost of sediment removal.

CHAPTER 10 – REOMMENDATIONS

Based on this feasibility report, the following are recommended:

- Prepare and submit to WDNR a Chapter 30 permit application for sediment removal activity,
- Prepare and submit RBF grant application to WDNR
- Conduct geotechnical slope stability analysis for banks of Nord, Sud and Sumac channel to determine maximum side slope for sediment removal,
- Prepare final design plans for sediment removal activity suitable for bidding purposes including survey, dewatering chamber, pore water discharge permit etc.
- Pursue Dane County Urban Water quality grant funds to install a sediment trap below Winnequah Road.

CHAPTER 11- FUNDING SOURCES FOR SEDIMENT REMOVAL

A number of funding sources exist for this project including the:

Recreational boating facility grant- The Recreational Boating Facilities program, authorized under section 30.92 of the Wisconsin Statutes encourages the development of recreational boating facilities and related activities by providing cost sharing assistance to municipalities. The city could receive a grant for 50% of the cost of dredging .

An integral portion of these grants is that the project provides or improves public access to lakes and motorboat travel. Dredging of a channel of a waterway is covered under the grant to the degree necessary to accommodate recreational watercraft. Eligible costs include engineering, soil borings, dredging and mobilization; construction of a temporary holding area; and transportation of dredge spoils. The RBF grant application must be submitted and presented to the Waterway Commission which meets quarterly. The chapter 30 permit must be obtained before the grant presentation to the Waterways Commission. The RBF grant can only be used for dredging purposes by a municipality once every ten years.

Fish America Foundation grant- The Fish America foundation unites the sport-fishing industry with conservation groups, government natural resource agencies, corporations and charitable foundations to invest in fish and habitat conservation and research across the country. The Fish America foundation has grown over the years and now provides nearly $1 million in matching grants each year to community partners, supporting conservation projects in all 50 states. Over the last twenty years, Fish America provided more than $6 million for more than 750 grass roots conservation projects nationwide. 66 fish restoration projects were funded in Wisconsin ranging from $2,000 to $20,000.

Sport Fish Restoration Grant- The Federal Aid in Sport Fish Restoration Act provides a funding source for management, conservation and restoration of fishery resources. The Sport Fish Restoration program is funded by revenues collected from the manufacturers of fishing rods, reels, creels, lures, flies and artificial baits through an excise tax to the US Treasury. Appropriate state agencies are the only entities eligible to receive grant funds. Each state's share is based 60% on its licensed anglers and 40% on its land and water area. No state receives more than 55% or less than 1%. The program is a cost-reimbursement program where the state covers the full amount of an approved project and then applies for reimbursement through Federal Aid for up to 75% of the project expenses.

EPA Clean Lakes Program under Section 319 grants - Clean Water Act Section 319(h) funds are provided only to designated state and tribal agencies to implement their approved nonpoint source management programs. State and tribal nonpoint source programs include a variety of components, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulatory programs. Each year, EPA awards Section 319(h) funds to states in accordance with a state-by-state allocation formula that EPA has developed in consultation with the states.

The May 1996 guidance states that "(s)ection 319 funds should not be used for in-lake work, such as aquatic macrophyte harvesting or dredging, unless the sources of pollution have been addressed sufficiently to assure that the pollution remediated will not occur."

Restrictions were put on in-lake work such as aquatic macrophyte harvesting and dredging due to concerns that the sources of the pollution need to be addressed first and also due to cost considerations.

National Fish and Wildlife Foundation grants-The National Fish and Wildlife Foundation operates a conservation grants program that awards matching grants, on a competitive basis, to eligible grant recipients, including federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Project proposals are received on a year-round, revolving basis with two decision cycles per year. Grants typically range from $10,000-$150,000, based upon need. Matching grants are awarded to projects that:

- Address priority actions promoting fish and wildlife conservation and the habitats on which they depend;
- Work proactively to involve other conservation and community interests;
- Leverage available funding; and
- Evaluate project outcomes.

A number of other payment options exist:

Local landowners- The landowners with lots abutting the channel and lakeshore could be assessed a portion of the dredging cost. Although all of the city residents will benefit from dredging the boat landing, the dredging of the channel will primarily benefit the local property owners.

Dane County- Dane County is responsible for controlling erosion control and sediment transport within the Pheasant Branch creek watershed originating from the unincorporated towns upstream of the City. Since the majority of the watershed is within the rural area of the Towns of Middleton, Westport and Springfield, Dane County should pay a portion of the dredging cost based on the percentage of the watershed within the towns. In 1972, Dane County contributed 33% of the dredging cost and recently has agreed to pay a portion of the dredging cost of the Yahara River as shown in Appendix C.