DAVID E. ROSS ASSOCIATES, INC.

Civil Engineers, Land Surveyors, Environmental Consultants

FEASIBILITY STUDY

PUMPING OPTIONS TO ACCOMPLISH A SHORT TERM DRAWDOWN OF BARE HILL POND

SUBMITTED TO: BARE HILL POND COMMITTEE

PREPARED BY: DAVID E. ROSS ASSOCIATES, INC.

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OVERVIEW

This firm previously prepared a report evaluating the feasibility, costs and permitting requirements of a 6-ft. drawdown utilizing gravity flow. Significant costs, environmental impacts and extensive permitting were associated with the dredging in the pond, dredging the wetlands, and replacement of downstream culverts that were required for a 6 ft. gravity drawdown. As a result of that report and the ensuing discussions at the Bare Hill Pond Committee meeting, this firm was asked to evaluate the feasibility of utilizing pumps to accomplish the desired 6-foot drawdown.

Six different pumping configurations were considered in this report and are as follows:
1.) Diesel engine trash pumps located on land.
2.) Land Based Pumps with Inlet Suction Pipes extending out into the pond
3.) Land Based Pump Station located near the earthen berm of the dam
4.) A Water Works Structure located in the water in front of the dam
5.) Submersible pumps in the pond at a depth of approximately 8-9 feet
6.) A custom made barge with the pumps located on the barge

PART ONE of this report describes the general requirements which apply to options #2 to #6. A brief description of each of the following topics is included:

- General drawdown concept
- General pumping requirements
- Power supply requirements
- Control Panel requirements
- Submersible Electric Cable,
- Suction Inlet Pipes and Outlet Pipes
- Energy Dispersion Structures
- Scuba Divers: Manpower for installation, maintenance, and emergencies
- Barge and crane for water based pumps

PART TWO of this report presents a general overview of the six pumping options listed above. Once a pumping concept has been agreed upon by the Committee, the details of the final design configuration and costs will need to be prepared by a civil engineer with considerable experience in hydraulics.

PART THREE is a brief discussion of the permitting requirements which may be required for the pumping pond drawdown. Due to the preliminary nature of the project, this is a general discussion and is supplemental to information submitted in the previous report.

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PART ONE- GENERAL REQUIREMENTS

GENERAL DRAWDOWN CONCEPT

This report is based upon the concept of removing the flash boards in mid to late September in order to start a gravity draw down. Pumping would then take over in mid to late October in order to complete the 6-ft drawdown before the pond freezes. The Committee's pond consultant has suggested that the weeds and mud flats be allowed to freeze for a five-to-ten day period. A lower level of pumping would need to continue during this time on a "maintenance" level. After adequate freezing has occurred, the pumps would all be turned off and water would then be allowed to re-flood the exposed weeds and mud flats.

As in the previous report, no evaluation of the effectiveness of the draw down, nor any comparison with other methods of weed control, is included in the scope of this report.

GENERAL DRAWDOWN PUMPING REQUIREMENTS

Using the Topographic Map of Bare Hill Pond, prepared by J. Henry, dated April 1979 at a scale of 1" = 400', an estimate was made of the volume of water which needs to be pumped out of the pond to accomplish a 6 foot drawdown. Based on pumping for 10 weeks, an estimate was made of the gallons per minute (gpm) which need to be pumped. This was then added to a base flow estimate of approximately 2,500 gpm. A total of approximately 7,500 to 8,000 gpm will need to be pumped to accomplish the total drawdown in 10 weeks. Once the drawdown level has been attained, it will be necessary to continue pumping to "maintain" the 6-ft drawdown level. The "maintenance" pumping is approximately 2,500 gpm. It is recommended that multiple pumps be used to provide the ability to turn off pumps, and to leave one pump operating on a "maintenance level". Multiple pumps also will provide redundancy in case of a breakdown. The pumps would need to be drained and winterized when the pumping season ends. A calculation was done of the flow capacities of the culverts at Rt. 110 and Under Pin Hill Road, and both are capable of handling the flow of the pumping.

The timing of the drawdown has flexibility, but an optimal schedule would be similar to the following: The gravity drawdown can start about the middle of September and the mechanical drawdown can be started the beginning to mid October. The goal would be to have accomplished the 6-foot drawdown and to be pumping on a maintenance level by the beginning to mid December. At this time freezing of the mud flats can be anticipated. The following pumping options are based on utilizing 3 pumps, each with a pumping capacity of 2,500 to 3,000 gpm. This configuration allows for turning 2 pumps off and leaving one pump on in order to maintain the drawdown level. Situations such as hurricanes or draughts will alter the pond levels and pumping times. An unusually rainy fall or major rain events such as hurricanes have the potential to exceed the capacity of the pumps so the drawdown level might not be attained.

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POWER SUPPLY

I have had multiple conversations with personnel from Mass Electric and everyone was very helpful and interested in providing information in regard to this project. During my initial conversations with Rick Nalewski , an engineer from Mass Electric, he indicated that the poles and power supply on Willow Road were built in 1930's and of poor quality. Willow Road is considered a "step down road" with 3-phase service on Rt. 110. Since any of the pumps that would be used would need 3 phase, 460 volt, the Willow Road lines would have to be up-graded. Victor Solarczk, at the Service Request Department of Mass Electric researched and visited the area. He indicated that a "ball park" estimate for bringing the upgraded service to the end of the cul de sac could be $75,000 to $100,000 depending on the equipment load demands. It is possible the poles might need to be replaced (owned by Telephone Company), easements may be required and trees may need to be trimmed, all for potential additional costs. The Service Request Department of Mass Electric, will give a more detailed cost estimate once the exact load requirements, the type of starter and sequence for starting up the motors has been determined. The cost of meters is included in the estimates. Scott Farrar is the Mass Electric representative for commercial and municipal services in Harvard and he will be the contact for the project. He gave me a "ball park" operating cost of $750-$1,000.00 per month to operate the 3 pumps sized as described above.

A second option is the use of generators to supply the power needed. These units can be rented, but they also have maintenance, monitoring and fuel supply issues. Since the generators will run 24 hours a day for 10 weeks, the noise to abutters would be a major objection. While this does not seem like a viable alternative, rental and costs associated with generators can be research if requested.

CONTROL PANEL

All of the options, which utilize three pumps, will require an electric control panel for running the pumps. It is anticipated the panel would be located on the land in the vicinity of the dam or berm. The panel would be in an enclosure for weather and security protection. The enclosures are usually stainless steel or fiberglass. A standard no frill panel with push button on/off and emergency stops would cost approximately $10,000 to $12,000.00. An upgraded control panel with variable speeds and remote abilities would cost a minimum of $20,000. If larger pumps were used, the price would be more. These estimates were received from Production Line Control Panels in Leominster, which provides and custom designs control panels for large and small projects.

SUBMERSIBLE ELECTRIC CABLE

Submersible, sunlight resistant electric cable would be needed to provide power from the control panel to the pumps that are located under water. Cost estimates from suppliers

ranged from $1.00 to $3.00 /ft for #4-6 gauge heavy duty, submersible, sun resistant wire with 3 lines plus a ground wire. We are estimating 3 lines of each approximately 400 feet in length with a cost range of $1,200 to $3,600.

SUCTION INLET PIPES

Depending on the pump location and configuration, most of the pumps will require inlet suction pipes and outlet discharge pipes. It is anticipated that each pump would have it's own inlet suction pipe and outlet discharge pipe. The actual needs for each option is described with the various pump options. The following are the general pipe specifications which are common to the pumping options.

The inlet suction pipes would run from land based pumps, out into the pond to depth which would accomplish the final 6 foot drawdown (could be 300' to 400'). The suction inlet pipe must be rigid or reinforced to prevent collapse due to the suction and must be large enough so as not to restrict flow. Loss due to friction should be calculated in the head. PVC pressure pipes are readily available with specifications suitable to this application. Costs are approximately $ 10.00 to $12.00 per liner foot for an 8" to 10" pipe. Assuming 3 pipes x 300 linear feet, gives a budget estimate of $ 9,000 to $11,000 for materials. As long as water is moving through the pipes, freezing is not a problem. When the pumps are turned off in December, the inlet control structure and elbow may need to be removed depending on materials, depth and design. The PVC pipes will drain and can remain in position on the mud flats. However, because of the long length of these pipes, maintaining suction in the pipes is a serious problem. Loss of suction ultimately results in burning out the pump motor. Check valves could be considered, but due to the long length and number of joints, the system may be difficult if not impossible to operate without incident.

An elbow with an Inlet Control Structure would need to be designed for the intake end of the pipes. It would need to be designed with proper size screening so as to keep out obstacles but not impede flow and provide a level of safety. The inlet should be at least 2 ft above the bottom of the pond to prevent clogging by silt. An inlet control structure could be a simple or complex structure and could cost several thousand dollars, depending on final design considerations. Estimate $ 2,000 to $3,000.00 for each unit, with a total of $6,000.00 to $9,000.00.

One other consideration is the weight of a 20ft. length of inlet suction pipe. Each pipe will weigh approximately 380 pounds and will have to be floated out on a barge and crane. The pipes are designed with bell and gasket connections, and are suitable for underwater applications. The lying of these pipes would have to be done by scuba divers.

OUTLET PIPES

An outlet discharge pipe or hose (8" to 10") would discharge water from the pump into a down gradient energy dispersion structure. The outlet pipe does not need to as heavy duty as the inlet suction pipe. The estimated cost is somewhat less than above, but within the same cost ballpark. The length will vary depending on the location of the pumps, but for budgetary purposes, we can estimate $10.00 per linear foot for each of the land based options. The three outlet discharge pipes can be estimated at 100 feet from the pump to the down-gradient side of the dam. The budget for this item is $1,000.00. For the water based pumps the outlet pipe will be 300 ft to 400 ft from the pump to the down gradient side of the dam. The budget estimate for this item is $4,000.00

ENERGY DISPERSION STRUCTURES

The outlet discharge pipes will discharge water to the wetland side of the dam or earthen berm. It will be necessary to reduce adverse impacts from the velocity of the discharge water by discharging the water into an energy dissipation structure. There are a wide variety of options that will accomplish the task. Some options are: a simple concrete tank with multiple outlet holes, a concrete sluiceway, very large boulders, concrete steps (similar to bulkhead), or staggered concrete block and rip rap. A heavy-duty jumbo dry well (10.5L 'x 5.5W' x 3'H) costs approximately $ 600.00. This price includes delivery and installation and assumes the area is ready for the structure. A pre-cast concrete bulkhead step costs $ 975.00. We would need 3 of these and rip rap at the base of the steps. Large concrete blocks 2'W x 2'd x 4'L cost about $50 each and weighs about 4,200 lbs. each. These would need to be laid out in a pattern to maximize the energy dissipation. Large stone rip rap would go between the blocks. Large boulders could also be used and would need to be sized properly so as to remain in place. Most of these applications will require some type of heavy equipment to put the structure in place. If the project was disbanded, the concrete tank and steps would need to be removed and additional costs for the heavy equipment would be incurred. It is possible that boulders, rip rap and concrete blocks could remain in position.

SCUBA DIVERS: MANPOWER FOR INSTALLATION, MAINTENANCE, REPAIR AND EMERGENCIES

Scuba divers will be needed for the installation of the pipes, pumps and barge. Union rates for commercial divers are $45/hr for a diver, $45/hr for safety diver and $35/hr for a tender. The minimum team is 3 divers. Installation will require 2 working divers for a team of 4. This results in a total of $170/hr, or $1,380 per day. It is difficult to know how long the installation of the pipes would take, but a week is assumed for budget purposes, with a cost of $ 7,000.00.

Plans would have to be made for emergency situations such as hurricanes, pump failure and vandalism. One person should be responsible for regular inspections of the equipment with the authority to call the scuba divers or maintenance personnel on short notice.

BARGE AND CRANE FOR INSTALLATION OF WATER BASED PUMPS

The water based pump options will require the rental of a barge and crane to position the pumps in the pond and to install the pipes. Barge units are available and are similar to what is used in bridge repairs. An "on-off" crane will also be needed to move the primary crane from the transport flat bed onto the barge. A crane and crane operator will be needed on the barge for positioning of the pumps and pipes. A heavy skiff will be needed to move the barge into position for the installation of the pumps and pipes. Astro Crane, Stow, MA has worked on projects requiring similar equipment. Assuming it takes one week to complete the installation, Rick Marshall estimates a budget cost of $20,000.00. This estimated cost would be less if the project takes less time to complete. Depending on the pump option, the barge and crane may be needed again in December to remove the pumps before the pond freezes. Depending on the time needed this could be an additional $5,000 to $6,000.00.

PART TWO – GENERAL DESCRIPTION OF PUMPING OPTIONS

1.) DIAPHRAGM OR "TRASH" Pumps

Trash pumps are standard pumps used by cities and DPW's to move large volumes of water quickly. They can be leased or purchased and located on land near the dam. The 6"x 6" diesel engine driven pumps would eliminate the need for the upgrade in electrical services. However, these pumps have a limited outflow capacity of 1400 gpm and would require 4 or 5 pumps running simultaneously. The fuel tanks run for only 16 hours and would need constant attention. The noise from these engines would be a significant problem to abutters. This option was not pursued any further

2.) BANK SIDE PUMP STATION

A concept similar to a sewer pump station was considered. The basic configuration would be to have water flow into a tank or wet well. The water is then pumped out of the tanks and water is discharged over the dam into an energy dissipation structure. The tank and control panel is all enclosed. The problem with this configuration is that the water in the tank must be at the elevation below the drawdown. This presents a problem similar to a gravity drawdown of "how to get the water into the tank without excavating in the pond". Since this would require an excavation of the pond bottom to provide the gravity feed to the well, this option was not pursued.

3.) LAND BASED PUMPS WITH LONG SUCTION INLET PIPES INTO POND

This option would locate 3 self-priming centrifugal pumps on land near the dam. The 3 pumps would be on a platform within an enclosure in the vicinity of the pond. Electric service would be above ground to a control panel. Three inlet suction pipes with an elbow and screening at the inlet end would extend out into the pond about 300–400 feet. Representatives from Gould and Flygt pumps said they did not recommend this configuration due to the long length of pipe, the problems with maintaining the suction and the potential of cavitation. Any break in suction results in burning out of the pumps. Estimating the cost of this option was not pursued.

4.) "WATER WORKS STRUCTURE"

A water works structure with pumps and enclosing structure would be located in the pond near the dam. No alterations are required to the dam, but this is a permanent structure which would house the pumps and valves. It would require construction work within the pond for the installation of the unit. The electric control panel would need to be enclosed and easily accessible on land. The intake and outlet pipes would be configured the same as above. Scuba divers would also be needed as stated above. Discharge water would flow into an energy dispersion structure below the dam.

I spoke with Rob Gillespie of RW Gillespie and Associates, Inc. consulting and environmental specialists and he gave me a verbal estimate as follows:

The cost for the construction, installation and materials for a water works structure including 3 pumps, valves and enclosure is approximately $250,000.

He estimates the cost laying 1200 feet (3X400') of 12" ductile iron intake pipe, including the pipe, barge rental and scuba divers is $100,000.

The construction, installation of an energy dissipation box is approximately $50,000.

The construction and installation of the electric control system is approximately $100,000.

ESTIMATED COST FOR A WATER WORKS STRUCTURE _____ $ 500,000.00

5.) SUBMERSIBLE PUMPS IN THE POND

As an alternative a land based pump configuration, manufactures recommended locating the 3 submersible centrifugal pumps in the pond at an elevation below the desired drawdown depth. The pumps would be attached to a support structure and platform.

Flygt Pumps carries centrifugal, submersible pumps with the desired specifications. They also supply a support structure that is suitable for attaching to a base located on the pond bottom. The pumps may need to be as much as 400 feet from the dam to reach the desired depth needed to satisfy the pump design requirements. Prior to committing to this approach however, a diver should investigate the pond bottom at this depth to be sure a hard and reasonably flat area could be prepared for a base structure. Inlet control structures could be required for safety and screening, but must be designed so as not to impede flow. The control panel would be located near the dam or berm. Submersible power supply cable would access the pumps by guide rails. The pumps would be on guide rails and accessible for repair or maintenance. The discharge outlet pipes would discharge to an energy dispersion structure on the down gradient side of the dam. The installation of the pumps and pipes would require a barge, crane and scuba divers for installation as described above.

The Flygt submersible pumps have a flow capacity of 2,500-3,000 gpm, have a load of 17 amps and cost about $ 11,000.00 per pump. This option eliminates the need for a long inlet suction pipe. Each pump weighs about 1,000 pounds. The support structure, pumps and outlet pipes would be floated into position with a barge, crane and scuba divers. When the project is completed in early winter, prior to the pond freezing, the support structure and pumps will need to be removed by a barge and crane to land. The pumps could be serviced and stored until the following fall. There is a potential problem if there is not enough water in the pond for the barge to access land. If this situation occurs, the submersible pumps and structure could be moved to deeper water depth so the pumps are below the frozen ice. If the pumps cannot be moved to land for winter storage, another option available is installing a circulator on the support structure to keep the water moving. Ceramic circulators with a thermostat are available at boat supply stores and cost about $600.00. Accessing the pumps for an emergency or maintenance could be difficult when they are surrounded by mud flats. The concrete base pad would remain in the pond all year long. The electric cable would be rolled up and removed. The flexible pipe would be able to withstand freezing and could remain in position all year.

ESTIMATED TOTAL COST _____ *$ 226,000.00*

6.) A CUSTOM MADE BARGE WITH 3 PUMPS

A custom made barge with 3 pumps mounted to the decking and securely moored at the required depth is alternative suggested by Chris Ashley. The barge would be a temporary structure that could be floated into position for the fall and removed to the edge of the pond prior to the pond freezing or when the ice melts. Various types of pumps could be used including a submersible pump on guide rails in an enclosed structure described above.

Depending on how the barge and pump is configured, there may not be a need for a complicated inlet pipe and control structure. The 300-ft. outlet discharge pipes would discharge over the spillway into an energy dispersion structure as described above. Depending on the pump inlet pipe configuration, problems could be encountered with vortices at the pump inlet and the introduction of air into the system. Check valves could be designed into the system to prevent these problems. The control panel would be on land and within an enclosure for easy access. Since the pumps will be pumping such a large volume, special consideration will have to be made for keeping the barge in place. Two mushroom anchors with chain and swivel could be bought new for $2-$3/ lb. (two 45 pound anchors would be adequate.) They can be removed off-season. Used ones are available and the anchors could be re-sold. Concrete blocks with I bolts could be used for slightly less, but they would be permanent, and have no re-sale value. Submersible, sunlight resistant electric cable would provide power from the control structure to the pumps.

A barge, crane and scuba divers will be needed to help with launching of the barge and pumps, installation of the outlet pipes and power lines, positioning the barge and anchors properly and securely. A scuba diver may need to be hired on a retainer basis to deal with emergency problems that might arise with the pump, pipes or barge. Accessing the barge when it is surrounded by large expanses of mud flats could also pose a maintenance access problem. Security could be an issue since the barge has the potential of being an "attractive nuisance" sitting on the water unattended. Due to the weight of the pumps and barge, it may be difficult to move the barge to land for the winter. However, the general goal would be to move the barge to the shoreline just after the pond is re-filled and before the pond is frozen. Once on land, the pumps could be winterized and the unit covered for the winter. There is a potential problem if there is not enough water in the pond for the barge to access land. If this situation occurs, the submersible pumps and barge could be floated to deeper water depth so the pumps are below freezing depth. If the pumps cannot be moved to land for winter storage, another option available is installing a circulator on the barge to keep the water moving. Ceramic circulators with a thermostat are available at boat supply stores and cost about $600.00. The advantage of this approach is if the results of the drawdown do not live up to expectations, the barge can be removed and there is no permanent structure to be maintained or dismantled.

A similar but slightly different alternative to a barge is a dock type of structure on legs with the legs secured to a base platform in the pond. The "dock" could be constructed so it could be detached from the legs and moved to shore when not in use. Additional permitting with Chapter 91 Waterway permit could be required. All other aspects are similar to the barge.

ESTIMATED COST FOR A BARGE ON THE POND _____ $ 246,000.00

PERMITTING

Since the permitting was discussed in detail in the previous report, only generalizations are provided regarding the permitting process. Most of the permits that were associated with the dredging of the pond and wetlands, will be required with a pumping process to accomplish the drawdown. The following permits may be required:

Notice of intent filed with the Harvard Conservation Commission under the Mass Wetlands Protection Act and the Harvard Wetland By-Law

The Wetland Protection Act has a category of Limited Projects 10-53(4), which allows the Commission to issue an Order of Conditions for projects, which will improve the natural capacity of a resource area including the removal of aquatic vegetation. The DEP issued an Interim Technical Guidance 90-TG-1 that specifies the information and impacts that need to be addressed in the Notice of Intent (NOI). The DEP Guidance is included in this document.

Hopefully the Commission will issue an Order of Conditions allowing the project. This Notice of Intent process has a built in regulatory time frame of a minimum of 7 weeks. Any extensions prolong this time frame. If the Commission denies the project and it is appealed to the DEP, then the DEP must issue a Superseding Order of Conditions. This can take several months. A separate appeal would also have to be made to Superior Court under the local wetland By-Law. Superior Court appeals can take 1-3 years.

If the Notice of Intent and Order of Conditions is appealed to the DEP and the DEP issues a superseding Order of Conditions, it is considered a "State Permit". If a State Permit is issued, the MEPA Wetland and Waterways Thresholds (310 CMR 11.03 (3) (a & b) will be triggered and a MEPA filing will be required.

Wildlife Study

The DEP Guidance specifies that the impacts on fisheries and wildlife must be addressed. Since thresholds for alteration of "land under waterbody" (LUWB) and bank will also be exceeded, a wild life study of the impacts of the drawdown must be included in the Notice of Intent.

MEPA

One of the MEPA review thresholds is a general category of LAND. This section (301 CMR 11.03 (1)(a) ENF and Mandatory EIR), sets a threshold of "direct alteration of 50 or more acres of land, unless the project is consistent with an approved conservation farm land or forest cutting plan or other similar generally accepted agricultural or forestry practices." The drawdown will temporarily alter over 90 acres of pond (land under water body) to mud flats. MEPA could consider the temporary alteration of over 50 acres of land as a

trigger for a filing. MEPA offers the opportunity to meet with a MEPA analyst to discuss the project, determine if filing is necessary, and to establish the level of information required in a filing. There are new provisions for filing an Expanded ENF if a full EIR is not needed. Any waivers can be discussed at that time. Depending on the extent of information required and opposition from residents, this could be an expensive and time-consuming process.

Also "a MEPA Environmental Notification Form (ENF) may be required when a project is subject to MEPA jurisdiction, even if it falls under the MEPA review thresholds if upon written petition by one or more agencies or ten or more persons, the Secretary invokes the fail-safe Review...". This rather confusing regulatory statement appears to mean that any agency or 10 aggrieved person can appeal to Secretary (of Environmental Affairs) and request an ENF be filed even if the project is under MEPA thresholds.

Chapter 91 Waterways Permit
It is my understanding that the Committee has an existing Waterways Permit for the 42" drawdown. An amended application should be made to DEP for a revised Waterways Permit, under the section 9.05 (2), e, lowering the water level of a Great Pond. If this is required, a new application could take 150 days.

Water Quality Certificate (401)
A Water Quality Certificate may be needed if certain thresholds for alteration of wetlands or land under water body are exceeded. The information required in the filing is the same as contained in the Notice of Intent, but in a different format and more detailed. Time frames for permit can take between 150 and 270 days.

Army Corp of Engineers 404 Permit
A filing with the Army Corps is likely under the category of "activities involving water withdrawals or water diversions." This filing is made after the Conservation Commission's Order of Conditions and the Water Quality Certificate have been issued. Time frames are similar and sequential to the Water Quality Certificate process.

Planning Board and Board of Selectmen
It is suggested that the Committee keep these boards informed and involved with the details of the project. While it does not appear that a drawdown will require site plan approval or a permit from the selectmen, since public funding will be utilized, informal meetings will be useful.

Board Of Health
Contact should be made with the Board of Health in regard to possible wells which might

be impacted by a 6-ft. drawdown. This potential problem should be discussed with the Board or any other agency that has knowledge of any shallow wells located around the pond. The DEP Guidance requires information be provided in the NOI on the impact of the drawdown on groundwater, shallow wells and bordering vegetated wetlands. It is likely that some type of groundwater impact study will be required by the Conservation Commission, DEP, MEPA or Board of Health.

ESTIMATED COST OF PERMITTING

Since the scope of the project has not been determined at this time, the extent of the permitting and number of studies is not known. However, based the basic requirements of the DEP Guidance on drawdowns, MEPA requirements and possible groundwater issues, a budgetary estimate for permitting and studies could be in the range of $80,000 to $90,000.00.

SUMMARY OF COSTS

ESTIMATED COSTS OF PUMPING OPTIONS

Option 1.) Trash Pumps	Not recommended
Option 2.) Pond side Pump Station	Not recommended
Options 3.) Land Based Pumps with Inlet Suction Pipes	Not Recommended
Option 4.) Water Works Structure	$ 500,000.00
Option 5.) Submersible Pumps with support structure in pond	$ 226,000.00
Option 6.) Custom-made barge with submersible pumps	$ 246,000.00

ESTIMATED COST OF PERMITTING

Unknown scope, but an approximate cost estimate	$ 90,000.000

ADDITIONAL COSTS

These costs will be determined by the scope of the job and can be obtained after a decision has been made on the option to be used.

Final design by civil engineer with experience in hydraulic
Site Contractor

SUMMARY STATEMENT

The above review of a variety pumping options, indicates that there are 3 feasible pump configurations which can accomplish the task of a 6-foot drawdown. While there a number of technical and equipment requirements that must be included in a pumping scenario, all of them utilize standard equipment or operating procedures.

The Water Works Structure is more expensive, permanent and more complicated structure to operate. This option may be more than is needed at this time.

The Pond Based Pumps as described in Options # 5 and #6, are generally similar in cost, general operating procedures and equipment requirements. Both configurations are temporary structures which can be removed from the pond. Both options must be moved to land before freezing so the pumps could be drained and prepared for the winter. The barge would require only a heavy skiff help float it to land. The pump with a support structure would require a crane and barge to lift the structure out of the water at the end of the season. There are potential problems if there is not enough water in the pond to float the pumps to land. Alternatives such as moving the pumps to deeper water or installing circulator pumps to prevent freezing are possible ways to address this potential problem. These issues would have to be worked out by the final design engineer

The permitting process for any type of drawdown is going to be intensive and will require additional studies such as wildlife, groundwater and well studies. The time frames to obtain all the permits could be 1 ½ to 2 years. Drawdowns occur on ponds throughout the state. As long as the project addresses the issues and concerns of the permitting agencies, there should be a good chance of obtaining a permit. However, because there are so many reviewing agencies, there is no guarantee that the project will be approved. Until the scope of the permitting process and number of studies have been defined, it is difficult to estimate the cost of the permitting process and time frames to obtain a permit.

Various companies were contacted to discuss various equipment designs and specifications, but no one brand of equipment or company is being recommended at this time. The intent of this study is to provide information to the Bare Hill Pond Committee in regard to various pumping options that at are available to accomplish a drawdown. The final details of the pump specifications, pipes, control structures, installation procedures, etc will need to be designed by a civil engineer with considerable experience in hydraulics. A site contractor will have to be hired to deal with all the subcontractors, scheduling and emergencies.

COST BREAKDOWN

The following breakdown is approximate costs rounding figures up to higher cost figures if ranges were anticipated.

Option #5 - Three Pumps attached to a Support Structure located in Pond

Power Upgrade	$ 100,000.00
Control Panel	$ 15,000.00
Three submersible pumps plus support structure	$ 35,000.00
Energy Dissipation Structure	$ 1,000.00
Electric cable- submersible, sun-resistent 3 lines	$ 3,600.00
Barge, cranes, operator,	$ 20,000.00
Outlet Pipe (3x400 ft)	$ 4,000.00
Inlet Control structure and valves	$ 5,000.00
Power (3 months)	$ 3,000.00
Scuba diver team	$ 7,000.00
TOTAL	**$ 226,000.00**

OPTION # 6- CUSTOM MADE BARGE WITH 3 PUMPS IN POND

Power Upgrade	$ 100,000.00
Control Panel	$ 15,000.00
Three submersible pumps	$ 35,000.00
Energy Dissipation Structure	$ 1,000.00
Electric cable- submersible, sun-resistent 3 lines	$ 3,600.00
Barge, cranes, operator, skiff	$ 20,000.00
Outlet Pipe (3x400 ft)	$ 4,000.00
Anchors	$ 300.00
Inlet Control structure and valves	$ 5,000.00
Power (3 Months)	$ 3,000.00
Scuba diver team	$ 7,000.00
Custom made barge	$ 20,000.00
TOTAL	**$ 246,300.00**

PERMITTING _____ **$ 90,000.00**

ADDITIONAL COSTS:

These cost will be determined by the scope of the job and can be obtained after a decision has been made on the option to be used.

Final design and specs by civil engineer

Site contractor