NOTICE OF PROJECT CHANGE AND WAIVER REQUEST

CRYSTAL LAKE/ELGINWOOD POND DREDGING PROJECT PEABODY, MASSACHUSETTS

ENSR®

EOEA FILE NO. 11325

Prepared for:

Department of Community Planning and Development, City of Peabody

for Submittal to:

Executive Office of Environmental Affairs, MEPA Unit

Prepared by:

ENSR
155 Otis Street
Northborough, MA 01532

November 14, 2000

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ENSR
Celebrating 30 Years of Excellence in Environmental Services

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November 14, 2000

Bob Durand, Secretary
Executive Office of Environmental Affairs
Attn: MEPA Office
Douglas Vigneau, EOEA No. 11325
251 Causeway Street, Suite 900
Boston, MA 02114

Re: EOEA 11325; Notice of Project Change/Request for a Waiver Dredging of Crystal Lake and Elginwood Pond, Peabody, Massachusetts

Dear Secretary Durand:

On behalf of the City of Peabody Department of Community Planning and Development, we are pleased to submit this Notice of Project Change (NOPC) and Request for a Waiver in compliance with 301 CMR 11.10(1) and 11.11 for the dredging of Crystal Lake and Elginwood Pond (Figure 1).

The previous NOPC for this project (noticed June 23, 1999) outlined an in-lake dewatering process using mechanical removal of the partially dried sediment as the preferred alternative. That alternative required construction of cofferdams and lake drawdown to accomplish the removal of accumulated sediment. As outlined in your July 23, 1999 Certificate on the NOPC, dredging in the dry can result in significant impacts to the environment due to lake drawdown. Since that June 1999 NOPC, the City of Peabody has prepared an alternatives analysis of other dredging methods (attached). As part of this analysis, a new hydraulic dredging method that eliminates extensive on-shore drying beds was evaluated. This analysis has revealed that there could be substantial cost savings associated with mechanical drying of hydraulically-dredged sediments. Specifically, belt filter press technology has advanced to the point where dredged sediments can be dewatered at rates and costs competitive with other dredging technologies, particularly at sites like the project site where dewatering lagoon construction options are limited. Because this technology is available and competitive, the City has changed the proposed dredge method to hydraulic dredging with mechanical dewatering. Drawdown of the lakes is no longer proposed and so the technical and environmental challenges related to that method are no longer of concern.

The following information is submitted with this NOPC as separate attachments to provide additional information and figures:

- Attachment A: Updated Dredging Plans,
- Attachment B: Dredging Alternatives Analysis,
- Attachment C: Sediment Reuse Plan, and
- Attachment D: Watershed Management Plan.

Wetland Protection Act Resource Areas

In the Spring of 1999, ENSR delineated and located the Wetland Protection Act (WPA) resource areas in accordance with 310 CMR 10.00. Sheet G-4: Resource Areas in **Attachment A** shows the existing WPA resource areas in and around the two ponds. This plan represents the results of detailed field investigations, topographic and bathymetric survey information, and pond hydraulics. Sheet G-4 also shows the areas where dredging is proposed in relation to the WPA resource area boundaries. As indicated on the plans dredging is not proposed in Bordering Vegetated Wetlands (BVWs), only in Land Under Water Ways (LUWW). Efforts were made to keep the limits of dredging more than 25 feet away from the edge of BVWs and to preserve the nearshore emergent macrophyte beds in LUWW. At the inlet and outlet locations of Elginwood Pond, this is not entirely feasible because of the amount of sediment constricting the narrow fingers of this pond. In these areas, some of the emergent macrophyte beds in LUWW will be removed, but BVW will not be dredged. These areas represent a small percentage of the total riparian wetlands around the two ponds. Construction equipment will access the two ponds at locations which do not have fringe wetland systems, such as along the railroad easement between the two ponds.

According to MEPA regulations, dredging activities within these areas must conform to the performance standards for LUWW as given in 310 CMR 10.56(4). The proposed work is not subject to the 5,000 square foot loss threshold of 310 CMR 10.10.55(4)(b) because BVW will not be affected. Dredging will affect approximately 14½ acres of LUWW, making the project categorically included for the preparation of an EIR (301 CMR 11.03(3)(a)1.b). The City is again asking for a Waiver from this requirement.

Dredging will take place only in LUWW. The project is designed to avoid temporary and permanent impact to BVWs. Therefore, a variance from the Wetland Protection Act is not required for this project and the Peabody Conservation Commission is empowered to issue an Order of Conditions for the dredging project. The project will also require a Major 401 Water Quality Certification from the Massachusetts Department of Environmental Protection (MADEP) and a Section 404 permit (either a Programmatic General Permit Category 2 or an Individual Permit) from the US Army Corps of Engineers (USACOE). Therefore, there are adequate regulatory review procedures to ensure full compliance with local, state and federal wetlands and water quality statutes, and the preparation of an EIR would not serve to further minimize environmental impact.

Proposed Dredging Methodology

The City proposes to remove sediments from the lakes using hydraulic dredging techniques and to dewater the sediment using belt filter press technology. The City conducted an extensive dredging alternative analysis resulting in selection of this method. A summary of this alternative analysis is attached. The proposed change in dredging methodology from in-place dewatering and mechanical excavation to hydraulic dredging with mechanical dewatering has several benefits, including the following:

- Reduced cost,
- Shorter duration,
- Less environmental impact, and
- Less aesthetic impact.

Mechanical dewatering, such as belt filter press technology, involves separation of sediments from water using machinery and the addition of polymer coagulants. A typical operation includes:

- removing the sediment from the lake via a hydraulic dredge,
- the sediment slurry is then pumped through a small "knock out" tank to remove cobbles and gravel,
- next the material flows to a large batch tank to even flow from the hydraulic dredge to the filter press,
- polymers will then be added and mixed into the sediment slurry,
- finally the filter presses squeeze the material into a more condensed state by removing much of the water (filtrate), and
- a conveyor belt system loads the filter cake from the presses directly to dump trucks.
- Filtrate will be returned to the lake.

The City proposes to dredge approximately 336,000 square feet of LUWW within Crystal Lake to a maximum depth of 10 feet. This will entail the removal of approximately 61,000 cubic yards of accumulated sediment (in-lake volume). Approximately 288,000 square feet of LUWW within Elginwood Pond will be dredged to a maximum depth of 8 feet, resulting in the removal of approximately 30,500 cubic yards of sediment (in-lake volume). The existing and proposed bathymetry and cross-sections of the two ponds are shown on plans included in **Attachment A**.

A total of approximately 91,500 cubic yards of sediment will be excavated from the two ponds. This volume of dredging exceeds the MEPA threshold for preparation of a mandatory EIR (310 CMR 11.03(3)(a)b.3). After mechanical drying this dewatered volume will be reduced by approximately 25 to 50%, resulting in a disposal volume of approximately 45,000 to 70,000 cubic yards of dewatered sediment.

The dredging and dredged material disposal designs and specifications will be carefully scrutinized in open, public, regulatory processes before the local Conservation Commission, the MADEP, and the USACOE. Review of the project in an EIR process would not result in additional environmental benefit and represents an unnecessary financial burden on the municipality.

Proposed Sediment Reuse Alternatives

The City evaluated numerous alternatives for the reuse of the material to be dredged from the lakes, including the following:

1. General use as a topsoil (without amendment),
2. General use as a topsoil amendment (mixed with sand),
3. Topsoil amendment for several landfill closure projects,
4. Use in composting, and/or various construction operations (with amendment),
5. Daily Cover at several landfills, and
6. Disposal at a licensed facility.

A summary of these sediment re-use alternatives is attached.

The City is planning to use the dredged material as a topsoil/topsoil amendment at the GCR landfill closure in Peabody. Under this alternative, the dewatered sediment will be trucked directly from the dewatering operation to the reuse site with no additional treatment needed. The sediment would be stockpiled for use as a topsoil or topsoil amendment over the landfill as part of the capping process in the landfill closure. The City has selected this as the preferred alternative pending agreement with GCR, Inc.

These alternatives and the proposed reuse protocol were outlined in a letter to Judy Perry of the Massachusetts Department of Environmental Protection (MADEP) Water Quality Certification Program (March 9, 2000). The DEP indicated in their response that the preferred alternative would require approval of the DEP Northeast Regional Office as part of the landfill closure plan. A response on that same issue was addressed to GCR, Inc. by the MADEP Northeast Regional Office, which indicated that "...the use of such soil in the closure of a landfill constitutes a viable reuse of the sediment..." (October 16, 2000 letter from Dave Adams included in Attachment C). Therefore, the preferred alternative is acceptable by the MADEP.

Watershed Management

A comprehensive watershed management plan has been prepared for Crystal Lake and Elginwood Ponds which is designed to negate the need for future dredging. This plan includes structural, procedural, educational, and regulatory control of watershed pollutants. The watershed management plan is attached.

Construction Traffic Estimates and Controls

The current design calls for construction to start in the early fall of 2000 and be completed by October 2001, although post-dredging restoration work may extend into the summer of 2002. During the initial phase of operation the dredging and dewatering equipment will be brought to a central staging area. This activity will require a minimum number of vehicle trips (approximately 5 to 10 flatbed trailers over a 2 to 4 day period) along Lowell Street to access the entry points to the ponds along the Boston & Maine Railroad easement. During dredging operations, large dump trucks (10 to 30 cubic yard capacity) will be required to move the material to the temporary staging site. As with other large excavation projects, we anticipate that the trucks will be queued at the entrance to the loading area, loaded, and sent to the disposal area. Up to three trucks per hour, operating during a 10-hour construction day will be routed in this manner. Prior to leaving the site each truck will be washed down to remove material from the tires, undercarriage, and exterior of the trailer. The wash-down will occur in a gravel-surfaced portion of the staging area surrounded by haybales and silt fence.

Summary

The September 23, 1997 Certificate on the ENF presented a fairly detailed scope of study to be included in the required EIR for the dredging project. With the exception of construction traffic, all of the items in that scope are issues that must be addressed in the design and permitting of the project. The purposes of the project are to improve recreational opportunities, fisheries habitat, and the aesthetics of these two urban ponds as well as restoration of degraded resource areas. Dredging is the only feasible means to increasing water depths in these systems. As shown in the alternatives analysis, the proposed methodology introduced herein will be the most cost effective, time efficient, and environmentally and aesthetically sensitive. The City is proposing to avoid impacts to BVWs to the greatest extent possible, acknowledges the short-term effects on LUWW, and proposes to construct sediment forebays to allow for future maintenance without affecting resource areas. Additionally, dredged material can be beneficially reused at the GCR landfill closure.

The City feels that there are adequate regulatory controls at the local, state, and federal levels to ensure that these issues are thoroughly reviewed in open and public processes, and that requiring preparation of an EIR will not serve to further minimize environmental impact. Preparation of an EIR will represent an additional expense to the City of Peabody that will yield little benefit to the environment and may effect the timing for the beneficial re-use of the dredged material. On behalf of the City of Peabody we ask that you waive the requirement for the preparation of an EIR for the Crystal Lake and Elginwood Pond Dredging project.

Should you have any questions, please me at 978/635-9500.

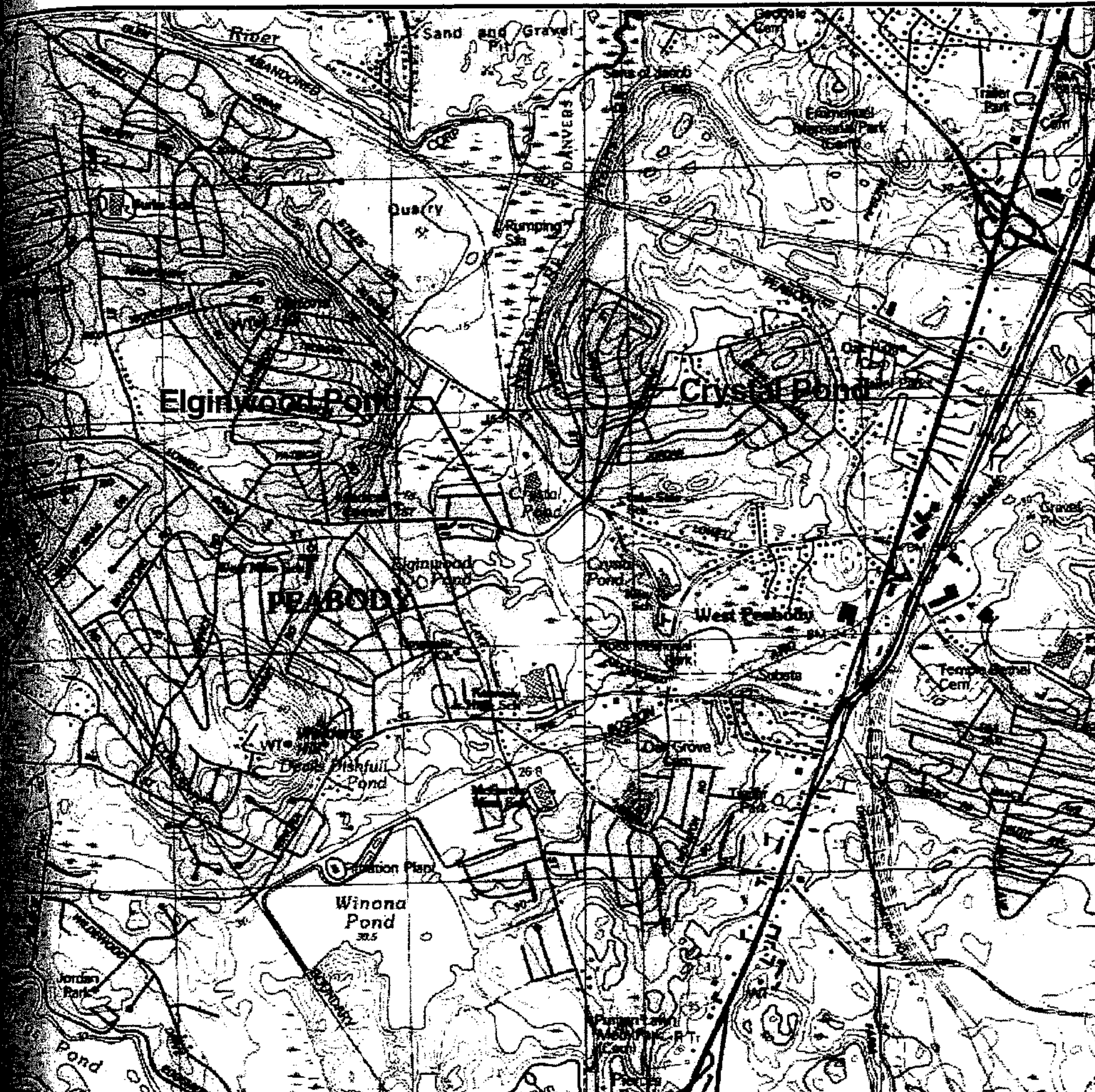
Sincerely,
ENSR International

Matthew J. Kennedy, PE
Senior Engineer

cc: Attached distribution list

attach:
Figure 1: Site Locus Map
Figure 2: NOPC/Waiver Request Distribution List
Attachment A: Updated Dredging Plans
- Sheet G-3: Existing Conditions
- Sheet G-4: Resource Areas
- Sheet D-1: Crystal Lake Dredge Plan
- Sheet D-2: Elginwood Pond Dredge Plan
- Sheet D-3: Crystal Lake Cross-Sections
- Sheet D-4: Elginwood Pond Cross-Sections
- Sheet R-1: Crystal Lake Restoration Plan
- Sheet R-2: Elginwood Pond Restoration Plan

Attachment B: Dredging Alternatives Analysis,
Attachment C: Sediment Reuse Plan, and
Attachment D: Watershed Management Plan.



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Site Locus Lowell Street Peabody, Massachusetts	Crystal and Elginwood Ponds Dredging Project MEPA NOTICE OF PROJECT CHANGE Job Number 8726-453	Figure 1 ENSR

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Notice of Project Change Distribution List

Dredging Of Crystal Lake And Elginwood Pond—EOEA 11325

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(2 copies)

Department of Environmental Protection
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Commissioner's Office
One Winter Street
Boston, MA 02108

DEP/Northeast Region
Attn: MEPA Coordinator
205-A Lowell Street
Wilmington, MA 01887

Massachusetts Historical Commission
The Massachusetts Archives Bldg.
220 Morrissey Boulevard
Boston, MA 02125

Metropolitan Area Planning Council
60 Temple Place – 6th Floor
Boston, MA 02111

MHD – District #4
Attn: Environmental Reviewer
519 Appleton Street
Arlington, MA 02174

Massachusetts Water Resources Authority
Attn: Environmental Reviewer
100 First Avenue
Charlestown Navy Yard
Boston, MA 02129

Massachusetts Bay Transit Authority
Attn: Environmental Reviewer
10 Park Plaza – 6th Floor
Boston, MA 02216-3966

U.S. Army Corps of Engineers
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City of Peabody
City Council
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24 Lowell Street
Peabody, MA 01960

City of Peabody
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City of Peabody
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24 Lowell Street
Peabody, MA 01960

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City of Peabody
Conservation Commission
City Hall
24 Lowell Street
Peabody, MA 01960

The Rev. Raymond H. Phyles
4 May Street
Peabody, MA 01960

ATTACHMENT B:
DREDGING ALTERNATIVES ANALYSIS

DREDGING ALTERNATIVES ANALYSIS

CRYSTAL LAKE/ELGINWOOD POND DREDGING PROJECT PEABODY, MASSACHUSETTS

Prepared for:

Department of Community Planning and Development, City of Peabody

for Submittal to:

Executive Office of Environmental Affairs, MEPA Unit

Prepared by:

ENSR
155 Otis Street, Northborough, MA 01532

November 13, 2000

CRYSTAL LAKE/ELGINWOOD POND DREDGING PROJECT
PEABODY, MASSACHUSETTS
DREDGING ALTERNATIVES ANALYSIS

Table of Contents

1.0 INTRODUCTION

The City of Peabody proposes to dredge Crystal Lake and Elginwood Pond to mitigate the effects of long-term cultural eutrophication. Multiple dredging technologies are available for this project. To determine the most feasible method, from technical, economic, ecological, and social perspectives, the project team evaluated a number of dredge process alternatives. This report summarizes the available technologies, describes the basis of evaluation, compares each alternative, and identifies a preferred alternative for the project.

2.0 DREDGING TECHNOLOGY SUMMARY

This section provides a summary of the available and applicable dredging technologies that were considered for Crystal Lake and Elginwood Pond. Dredging projects generally involve three distinct processes:

- Dredging/Sediment Removal,
- Sediment Dewatering, and
- Reuse/Disposal of Sediments.

Each of these processes can be performed by multiple methods. Re-use/disposal of sediments is addressed separated from this analysis. The following summarizes the technologies that were considered for this project.

2.1 Available Dredging Technologies

Dredging in lakes is generally performed by one of two methods:

- hydraulic dredging, or
- mechanical dredging.

The following is a brief description of each method.

2.1.1 Hydraulic Dredging

Hydraulic dredging is performed by removing water and sediment in a "slurry" from the lake bottom. The sediment and water is then separated by one of several means and the water returned to the lake. A hydraulic dredge typically consists of barge-mounted cutter head that feeds excavated sediment to barge-mounted pump unit. One or more booster pumps may be employed if the distance to the dewatering area is large or if the elevation change is great. Hydraulic dredges typically operate at flows of approximately 2,000 gallons per minute and a solids concentration of approximately 10%. The dredge "slurry" is piped from the dredge to the dewatering area.

2.1.2 Mechanical Dredging

Mechanical dredging is performed by physically removing lake sediments with excavation equipment such as clamshells, drag lines, excavators, and front-end loaders. Removed sediments are then transported to a temporary drying site (or reuse site if already sufficiently dewatered) with standard earth moving equipment (i.e., dump trucks). Mechanical dredging may be performed in either wet (i.e., sediment under water) or dry (i.e., water removed from lake) conditions. However, the physical characteristics of the sediment limit how mechanical dredging may be performed. Sandy sediments with low organic content are best suited for mechanical dredging in wet conditions because they have relatively low in-place water content and dewater rapidly when excavated. These sediments are relatively easy to handle with earth moving equipment. On the other hand, sediments with high silt and organic content are generally difficult or impossible to handle in wet conditions because they have a high in-place water content and retain a great deal of water when excavated. These sediments are better suited to dredging in dry conditions.

2.2 Available Dewatering Technologies

Several methods are used to dewater the sediment including the following:

- Lagoon,
- Mechanical (Filter Belt Press), and
- In-Place.

2.2.1 Lagoon Dewatering

Lagoon dewatering involves separating sediments from water via physical settling in a series of ponds. Lagoon dewatering operations for hydraulic dredges are typically conducted in two steps:

- Primary settling in a relatively large basin (usually greater than 12 hour residence time), and
- Secondary settling in a relatively small basin (usually 1 to 2 hour residence time) with the aid of chemical coagulants (e.g., polymers, aluminum sulfate, etc.).

The primary phase of settling removes the majority of sediment. The main purpose of the second phase is to remove colloidal particles to provide a good quality discharge stream. Sediments are left in the lagoons following dredging operations until they have dried via evaporation and percolation sufficiently for their intended reuse.

Lagoon dewatering for mechanical dredge operations is typically conducted in one step, because the sediment from this type of operation has much lower water content than hydraulic dredges. The main purpose of the lagoon for a mechanical dredge operation is to provide a place for the sediments to dry.

Lagoon dewatering operations require a large area relative to the area of the lake to be dredged, and can be difficult to site. Ideally a dewatering lagoon should be sized to contain the entire volume of sediments to be dredged in a season. Otherwise, when the lagoons reach capacity, dredging operations must be discontinued for a month or more until the sediments are desiccated and removed. Dividing the primary pond into multiple units can help to minimize the downtime, but the overall volume of the containment area is still the limiting factor for the speed of the project.

2.2.2 Mechanical Dewatering

Mechanical dewatering involves separation of sediments from water using machinery such as belt filter presses. Polymer coagulants are commonly used in this process to enhance filtrate quality and to produce a more consolidated filter cake. Mechanical dewatering would typically be used in conjunction with a hydraulic dredging operation. A typical operation would include the following components, in order:

- One hydraulic dredge,
- Small "knock out" tank for the removal of cobbles and gravel,
- Large batch tank to even flows from hydraulic dredge to filter presses (typically dredges operate a much higher flow rates than presses),
- Polymer addition and mixing system,
- Two to four filter presses operating in parallel,
- Conveyor belt system to load filter cake from presses directly to dump trucks, and,
- Return line to the lake for filtrate.

The primary advantage of mechanical dewatering over other methods is the small area required for the operation. The mechanical equipment capacity will generally limit the overall production rate with this dewatering method. The overall speed of projects using mechanical dewatering can be slower than other operations because the hydraulic dredges cannot operate full time. However, the speed of this operation is superior to operations using small capacity lagoons. In the past, the cost of mechanical dredging was prohibitive, due to the relatively low throughput of the operation. However, the technology has advanced to the point where it is competitive with other methods, especially where space is limited.

2.2.3 In-Place Dewatering

In-place dewatering involves temporarily removing the water from a lake to allow the sediments to dry. Once sufficiently dry the sediment is removed using standard earthmoving practices. The main challenge for such an operation is to draw down and maintain lake water levels at an elevation below the desired dredging depth. A number of strategies are typically used for these projects including:

- Gravity drawdown,
- Pumping,
- Coffer-damming, and
- By-pass channels.

In-place drying times vary depending on the sediment composition, with more organic sediments taking longer to dry than mineral soils. Drying times could be as long as several months and are extremely dependent on weather conditions. A significant disadvantage of this method is that the dewatering operation will be breached by a storm event, re-filling the lake, and re-wetting the sediment.

3.0 ALTERNATIVE IDENTIFICATION

The project team selected the following practical dredging alternatives from the previously discussed technologies for further consideration:

- Hydraulic - Lagoon
- Hydraulic - Filter Belt Press
- Mechanical – In place
- Mechanical - Lagoon

The following is a brief discussion of each selected alternative.

3.1 Hydraulic Dredging – Lagoon Dewatering

This alternative consists of hydraulic dredging with lagoon dewatering. Hydraulic dredging is feasible for both ponds, but, vegetation in Elginwood Pond may have to be harvested prior to dredging. Also discharge from the lagoon would have to be directed back to Crystal Lake to maintain a sufficient water level for hydraulic dredging. Siting a dewatering lagoon is the main obstacle for this alternative. Although the City owns a significant amount of land near the lakes, much of it is either wetland resource area or topographically constrained. An abandoned gravel pit located approximately 1,500 feet northeast of Crystal Lake, would serve as the best candidate for the lagoon site. However, the site would require the construction of an approximately 500-foot access road and the removal of several acres of forest. Even then, this site would provide limited capacity relative to the proposed dredge volumes. Thus, each lake would have to be dredged in phases, extending the project length and cost.

3.2 Hydraulic Dredging – Filter Belt Press Dewatering

This alternative consists of hydraulic dredging with filter belt press dewatering. As discussed above, hydraulic dredging is feasible for both ponds. Since the filter belt press operation requires significantly less space than lagoon operations, siting is less of a constraint. The causeway between Crystal Lake and Elginwood Pond would most likely serve as the dewatering location.

3.3 Mechanical Dredge – In-Place Dewatering

This alternative consists of in-place dewatering of sediments and mechanical dredging. Dewatering of Crystal Lake would be accomplished by pumping and gravitational bypass of its main stormwater inflow using either temporary piping or cofferdams. Elginwood Pond would require pumping as well as gravitational by-pass of its three main inputs. The required dewatering operations would be complicated and would likely have to be maintained for 4 to 5 months for each lake. Many pumping and conveyance devices would have to work together during full-time operation to bypass baseflow and storm flows. The main advantage of this alternative is that it requires the least amount of land outside of the lakes. The main drawbacks to this alternative are the uncertainty associated with in-place-drying time, and the aesthetic and environmental impacts associated with lake drawdown. Several uncontrollable variables affect the sediment drying time including material properties, humidity, and rainfall.

3.4 Mechanical Dredge – Lagoon Dewatering

This alternative consists of mechanical dredging with lagoon dewatering. Dredging would most likely be accomplished using a barge mounted clamshell bucket. Sediments would be transported to the shore by barge, and from there to the dewatering lagoon using lined dump trucks. Mechanical dredging of the sediments from the lakes would be difficult because of their small grain size and high organic and water contents. This type of dredging is likely to create a considerable turbidity problem within the lakes. Siting of a dewatering lagoon would be subject to the same constraints discussed above. A disadvantage of this method is the number of times sediment must be handled (lake to barge, barge to truck, truck to lagoon) and the associated costs.

4.0 ALTERNATIVE EVALUATION

4.1 Criteria for Evaluation

The following criteria were used for evaluating the available dredging alternatives:

- Technical feasibility,
- Cost,
- Project duration,
- Relative water quality impact,
- Relative aquatic fauna impact,
- Relative BVW impact,
- Relative traffic impact,
- Aesthetic impacts, and
- Relative upland impact.

The following is a brief description of how each criterion was applied.

4.1.1 Technical Feasibility

The project team determined whether each alternative was technically feasible, based on the known properties of the sediment and engineering judgement. Technically infeasible alternatives were not further considered for selection.

4.1.2 Cost

The project team estimated the overall cost of each alternative including design, construction, operation, and site restoration. Costs associated with transporting the sediments to the reuse site were not included in the cost, but these costs should be relatively equal for all of the alternatives.

4.1.3 Project Duration

The project team estimated the total project duration of each alternative based on:

- Dredge equipment (production rates)
- Sediment dewatering rates,
- Filter equipment capacity, and
- Seasonal limitations on the various operations required for each alternative.

4.1.4 Relative Water Quality Impact

The project team assessed the relative impact to in-lake water quality of each alternative during dredging operations. Each alternative was qualitatively estimated to have low, medium or high impact to lake water quality based on the turbidity the various dredging methods cause. Alternatives involving drawdown were considered to have high impact.

4.1.5 Relative Aquatic Fauna Impact

The team estimated the relative impact to aquatic fauna, particularly fish and turtles, for each proposed alternative. Loss of aquatic fauna will be high for any dredging operation, due to the nature of the activity. However, some alternatives are more favorable in this respect than others. The team qualitatively rated each alternative as having a low, medium, or high relative impact to aquatic fauna based on the portion of the lakes that would typically be disturbed at one time. Alternatives that would segregate the active work area to a small portion of the lakes were rated as having a low impact to fauna. Conversely, alternatives that would work the entire lake at once were rated as having a high impact.

4.1.6 Relative BVW Impact

The project team evaluated the relative impact to bordering vegetated wetlands (BVWs) for each alternative. While none of the alternatives involves permanent loss of BVW, alternatives involving drawdown of the lakes could impact wetland hydrology for the duration of the drawdown, which could result in alterations of the BVW. The project team qualitatively rated each alternative as having a low, medium or high BVW impact based on the magnitude and duration of lake water level modifications associated with the alternative. The quantity of work within buffer was also factored into this rating.

4.1.7 Relative Traffic Impact

The project team qualitatively evaluated the relative traffic impacts for each alternative. The team deemed alternatives involving multiple moves of sediment near the project site as having a higher potential for traffic impacts.

4.1.8 Private Well Impact

The project team evaluated the relative impacts of each alternative on the several private wells in use adjacent to Elginwood Pond. Several shallow private wells are located adjacent to Elginwood Pond. Drawdown of the lakes could significantly impact the yields of these wells. Degradation of lake water quality during dredging activities could also impact these wells. The project team qualitatively rated each alternative as having a low, medium or high impact on private based on the magnitude and duration of lake water level modifications and lake water quality impact associated with the alternative.

4.1.9 Aesthetic Impacts

The project team qualitatively evaluated the potential aesthetic impact of each alternative, including odor, noise and visual impacts.

4.1.10 Relative Upland Impacts

The project team evaluated the relative disturbance of undeveloped upland areas associated with each alternative. The project team rated each alternative as having a low, medium, or high relative impact to undisturbed upland areas, based on the work required within such areas.

4.2 Alternative Comparison

The project team evaluated each alternative using the criteria listed above. **Table 1** is a matrix comparing each alternative. A description of the each alternative's ranking follows:

Table 1
Dredging Alternative Matrix

Dredge Method →	Hydraulic		Mechanical	
De-water Method →	Lagoon	Belt Press	In-Place	Lagoon
Preferred Alternative		✓		
Technically Feasible	✓	✓	✓	[1]
Approx. Cost ($/Cubic Yard)	~$25.00	~$12.00	~$20.00	[2]
Project Duration (construction seasons)	3-4	2	2-3	>4
Relative Water Quality Impact	Med.	Med.	High[3]	High
Relative Aquatic Fauna Impact	Low	Low	High[4]	Low
Relative BVW Impact	Med.	Low	High[5]	Low
Relative Traffic Impact	Med.	Low	Low	High
Private Well Impact	Low	Low	High[6]	Med.
Aesthetic Impacts	Med.	Low	High	Med.
Relative Upland Impact	High[7]	Low	Low	High[8]

1 Sediment composition would make mechanical dredging of submerged sediment impractical.
2 Costs not estimated for this alternative because it was not deemed feasible.
3 Temporary removal of lake volume considered high impact.
4 Alternative would likely result in loss of virtually all aquatic fauna.
5 Drawdown of lakes could temporarily impact BVW hydrology.
6 Drawdown of lakes would be likely to significantly affect shallow well yields.
7 Lagoon construction would require development within wooded uplands.
8 Lagoon construction would require development within wooded uplands.

4.2.1 Hydraulic - Lagoon

Technical Feasibility

This alternative was deemed to be technically feasible by the project team

Cost

The project team estimated a $25 per cubic yard (in-lake) cost for this alternative.

Project Duration

The project team estimated a time of three to four construction seasons to complete this alternative. This alternative's duration is long relative to other alternatives. The small area available for dewatering lagoon necessitates multiple phases of dredging/dewatering for each lake. Dredging operations must be suspended between cycles until sediments in the filled lagoons dries and is removed, thus increasing the length and cost of the project.

Relative Water Quality Impact

The project team rated this alternative's relative water quality impact as medium. Since the alternative uses hydraulic dredging, dredging-related turbidity will be minimized. The main potential for water quality impacts with this alternative is related to the quality of the dewatering return water. However, primary and secondary within the lagoons should produce a relatively good water quality of the return water.

Relative Aquatic Fauna Impact

The project team rated this alternative's relative aquatic fauna impact as low. Hydraulic dredging will only affect a small percentage of the lake at one time and will allow fauna to access the majority of the lake during the dredging operations. However, dredging operations by their nature will have a significant impact on lake fauna.

Relative BVW Impact

The project team rated this alternative's relative BVW impact as medium. While the alternative does not directly impact wetlands or their hydrology, most of the lagoon and its access drive would be constructed within a buffer zone to a BVW.

Relative Traffic Impact

The project team rated this alternative's relative traffic impact as medium. The project team deemed that this alternative have a greater traffic impacts than other operations with the same intensity of truck use because access to the dredge dewatering area would be via a secondary, residential roadway, which currently has limited truck traffic as opposed to a primary road.

Private Well Impacts

The project team rated this alternative's private well impact as low. The hydraulic dredging will not affect water elevations in the lake, so well yields will not be impacted.

Aesthetic Impacts

The project team rated this alternative's aesthetic impacts as medium. Potential aesthetic impacts associated with this alternative include odor impacts during lagoon dewatering, and visual and noise impact of dredging equipment and dewatering facilities.

Relative Upland Impact

The project team rated this alternative's relative upland impact as high. This alternative would require significant upland development for the construction of dewatering lagoons and appurtenances.

4.2.2 Hydraulic - Filter Belt Press

Technical Feasibility

This alternative was deemed to be technically feasible by the project team.

Cost

The project team estimated a $12 per cubic yard (in-lake) cost for this alternative.

Project Duration

The project team estimated a time of two construction seasons to complete this alternative; one season for each lake.

Relative Water Quality Impact

The project team rated this alternative's relative water quality impact as medium. Since the alternative uses hydraulic dredging, dredging-related turbidity will be minimized. The main potential for water quality impacts with this alternative is related to the quality of the dewatering return water. However, the use of polymer coagulants should produce a relatively good water quality of the return water. Additionally, the filtrate will be pumped to a temporary settling area created with floating turbidity barriers in Crystal Lake.

Relative Aquatic Fauna Impact

The project team rated this alternative's relative aquatic fauna impact as low. Hydraulic dredging will only affect a small percentage of the lakes at one time, allowing much of the lakes' fauna access to the majority of the lake at all times. However, dredging operations by their nature will have a significant impact on lake fauna.

Relative BVW Impact

The project team rated this alternative's relative BVW impact as low. The alternative will not directly impact wetlands or their hydrology nor does it require significant construction within BVW buffer zone.

Relative Traffic Impact

The project team rated this alternative's relative traffic impact as low. This alternative will require the smallest volume of truck traffic and truck access will be via a primary road.

Private Well Impacts

The project team rated this alternative's private well impact as low. The hydraulic dredging will not affect water elevations in the lake, so well yields will not be impacted.

Aesthetic Impacts

The project team rated this alternative's aesthetic impacts as low. Potential aesthetic impacts associated with this alternative include visual and noise impact of dredging equipment and dewatering facilities. This alternative requires the least area of the four alternatives, so visual impacts will be minimized. Noise impacts will be limited to dredge operation hours.

Relative Upland Impact

The project team rated this alternative's relative upland impact as low. This alternative would not require development of vegetated upland.

4.2.3 Mechanical – In place

Technical Feasibility

This alternative was deemed to be technically feasible by the project team.

Cost

The project team estimated a $20 per cubic yard (in-lake) cost for this alternative.