D. SEPA Checklist

King County
Surface Water Management Division
Department of Public Works
700 Fifth Avenue Suite 2200
Seattle, WA 98104
(206) 296-6519
(206) 296-0192 FAX

April 13, 1995

TO: Lake Desire Project File

FR: Sharon Walton, Lake Desire Project Manager

RE: *Lake Desire Management Plan* SEPA checklist addendum

For the *Lake Desire Management Plan*, non-project SEPA checklist (Determination of non-significance [DNS] dated March 2, 1995), under Section 5a. fish, salmon should underlined in addition to bass and trout. This was an inadvertent omission in the original SEPA checklist which was brought to my attention by the Muckleshoot Indian Tribe in their comment letter dated March 23, 1995.

Given (1) the non-project nature of the DNS and (2) that supporting documents to the DNS clearly document the presence of salmonids (and thus this correction does not represent new information) a new determination is not warranted. For all project actions in the plan, separate SEPA compliance will be completed as stated in the *Lake Desire Management Plan*, non-project SEPA checklist.

cc: SEPA Distribution list

King County Surface Water Management Division
Lake Desire Cost Benefit Analysis
January 1995

KCM
KCM, Inc.
1917 First Avenue, Seattle, WA 98101-1027

Technical Memorandum
Lake Desire Cost Benefit Analysis

Prepared for
Sharon Walton
King County Surface Water Management Division

Prepared by
KCM
KCM, Inc.
1917 First Avenue
Seattle, WA 98101-1027

principal author
Bill Jones

Project No
2390026-023

DETERMINATION OF NON-SIGNIFICANCE

Name of Proposal: Lake Desire Management Plan

Description of Proposal: Water quality management plan for Lake Desire and its watershed.

Location of Proposal: The plan contains both project and nonproject actions that will apply to Lake Desire and its watershed in unincorporated King County

Responsible Official:	Paul Tanaka
Position/Title:	Director, King County Department of Public Works
Address:	400 Yesler Way Room 700 Mail Stop 7Y Seattle, Washington 98104-2637
Phone:	(206) 296-6500

DATE: 3-2-15 SIGNATURE: _____

Proponent and Lead Agency:	King County Department of Public Works Surface Water Management Division
Contact Person(s):	Sharon Walton, Senior Limnologist (206) 296-8382

pra9

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. THIS INFORMATION IS AVAILABLE TO THE PUBLIC ON REQUEST (for a nominal photocopying fee).

THE DETERMINATION OF NON-SIGNIFICANCE (DNS) is issued under WAC 197-11-340(2); the lead agency will not act on this proposal until after March 17, 1995. Comments must be submitted or postmarked by this date.

You may appeal this determination by filing a Notice of Appeal with the responsible official of the lead agency given above. In accordance with King County Code 27.48.010 and 27.48.020, all appeals to the Zoning and Subdivision Examiner must be accompanied by a check for $125.00 at the time of submittal to the lead agency. The check should be made out to the King County Surface Water Management Division. This notice will then be filed with the Zoning and Subdivision Examiner's Office and a hearing date will be set. You will be notified two weeks in advance of the hearing date. You should be prepared to make factual objections. A Notice of Appeal is a letter stating the following:

1. The name of the proposal
2. The action to which you object (the DNS)
3. The agency taking the action (Public Works)
4. The basis for the objection (why the proposal would have significant adverse impact on the environment)
5. Your name and how you can be reached

Any Notice of Appeal for this Determination of Non-Significance must be received or postmarked no later than March 17, 1995. You should be prepared to make specific factual objections. If you have any questions regarding this project, please call Sharon Walton, Senior Limnologist, at 296-8382.

If you wish to file a Notice of Appeal, please send it to:

Jim Kramer, Manager
King County
Surface Water Management Division
700 Fifth Avenue, Suite 2200
Seattle, WA 98104

If you have any questions about the procedures for SEPA appeals, please call the Zoning and Subdivision Examiner at (206) 296-4660.

KING COUNTY
ENVIRONMENTAL CHECKLIST

Purpose of the Checklist:

The State Environmental Policy Act (SEPA), Chapter 43.21 RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write **"do not know"** or **"does not apply."** Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of Checklist for Nonproject Proposals:

Complete this checklist for nonproject proposals, even though questions may be answered **"does not apply."** In addition, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (PART D).

For nonproject actions, the references in the checklist to the words **"project," "applicant,"** and **"property or site"** should be read as **"proposal," "proposer,"** and **"affected geographic area,"** respectively.

A. BACKGROUND

1. *Name of the proposed project, if applicable:*

   Lake Desire Management Plan

2. *Name of Applicant:*

   King County Department of Public Works
   Surface Water Management (SWM) Division

3. *Address and phone number of applicant and contact person:*

   Sharon Walton, Senior Limnologist
   King County SWM Division
   700 Fifth Avenue, Suite 2200
   Seattle, WA 98104
   Phone: (206) 296-8382
   FAX: (206) 296-0192

4. *Date checklist prepared:*

   February 27, 1995

5. *Agency requesting checklist:*

   King County Department of Public Works
   SWM Division

6. *Proposed timing or schedule (including phasing, if applicable):*

   Implementation of the management plan is proposed to be funded through Centennial Clean Water Fund (CCWF) grant, private sector funding, and lake management district formation. CCWF application will occur in February, 1995. Lake management district formation will be initiated in July, 1995 and is proposed to be completed in September, 1996. Depending upon implementation funding, design and engineering for in-lake aeration system could be initiated in 1996, completed, and installed in 1997. Depending upon funding, the remaining management plan activities would be initiated and performed between 1997-2002.

7. *Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.*

No additional work is planned beyond what is currently contained in the management plan.

8. *List any environmental information you know about what has been prepared, or will be prepared, directly related to this proposal:*

Lake Desire Management Plan, Draft Plan, prepared by King County and KCM, Inc., January 1995; Final Plan, April 1995 (proposed).

Lake Desire Background and Technical Reports, prepared by King County and KCM, Inc., December, 1994

9. *Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.*

King County is intending to assist the Lake Desire community in the formation of a lake management district to fund a portion of the implementation costs of the lake management plan. The process for lake management district formation will be initiated in 1995. If formed, the lake management district will be operational for five-years. Additional private sector funds may also be available to fund a portion of the project costs for in-lake aeration.

King County is also intending to apply for additional funds from the Washington State Department of Ecology Centennial Clean Water Fund to cover a portion of the implementation costs.

Several residential development proposals are in various stages of governmental approval. The development of these properties without implementation of the lake management will likely result in a worsening of lake water quality.

10. *List any government approvals or permits that will be needed for your proposal, if known:*

Environmental Checklist
King County Council adoption of the Lake Desire Management Plan
Washington State Department of Ecology Approval

11. *Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)*

The proposal will involve the implementation of watershed measures, in-lake measures, aquatic plant management measures, and long-term lake, fishery, and watershed monitoring programs as described in Chapter 7 of the Lake Desire Management Plan. The watershed measures will be applied throughout the Lake Desire watershed. The lake is 80 acres in size and will be the site for alum treatment (one-time application) and installation of an in-lake aeration system. Separate SEPA compliance will be conducted for in-lake measures.

12. *Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.*

Lake Desire is located in the Cedar River watershed approximately 5 miles northwest of Maple Valley in King County, Washington (Figure 1). Access to the lake is via Petrovitsky Road, which passes to the south of the lake. Petrovitsky Road connects with 140th Way SE, a major roadway extending south from Highway 169 approximately 2 miles east of Interstate 405. West Lake Desire Road, a minor road branching off of Petrovitsky Road via SE 184th St., provides access to the Washington State Department of Fish and Wildlife operated public boat launch, located on the northern shore of the lake, and the 400 acre open space tract along the south eastern side of the lake (Figure 2). The watershed includes portions of Section 25 and 36, R5E, T23N and Sections 30 and 31, R6E, T23N.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (underline one): Flat, rolling, hilly, steep slopes, mountainous, other.

The watershed topography ranges from 500 to 860 feet above mean sea level. The majority of the watershed is a mixture of gently sloping forested hills with several moderate sized wetlands in the valleys.

b. What is the steepest slope on the site (approximate percent slope)?

To the east of the lake, a steep hill rises 360 vertical feet in approximately 1000 horizontal feet (approximate slope, 20%).

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

The predominate soil type in the watershed is AgC-Alderwood Gravely Sandy Loam (slope 6-15%). Other soil types present include AgB- Alderwood Gravely Sandy Loam (slope 0-6%), AgD- Alderwood Gravely Sandy Loam (slope 15-30%), Everett Gravely Sandy Loan (slope 6-15%), and Or-Orcas Peat.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

The King County Sensitive Area Folio shows the hillslope immediately to the east to be an erosion and landslide hazard area (King County, 1990).

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Does not apply.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Not applicable to the plan itself. Erosion could result during the installation of the in-lake aeration system. Appropriate measures will be taken to prevent sediment and turbid water from entering the lake.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable to the plan itself. A 300-400 square foot building will be constructed to house the air compressor for the in-lake aeration. The final design and location of the compressor building remains to be determined. The existing boat launch is a likely site pending final system design and approval by the Washington State Department of Fish and Wildlife.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Not applicable to the plan itself. Appropriate measures will be taken during construction to control erosion. All disturbed areas will be stabilized following construction.

2. Air

a. What types of emissions to the air would result from the proposal (for example, dust, automobile, odors, industrial, wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.

Not applicable to the plan itself. Minor dust emissions during the construction of the compressor building could occur in the immediate area. No impacts to air quality will occur upon completion of the project construction.

b. Are there any off-site sources of emissions or odors that may affect your proposal? If so, generally describe.

Does not apply.

c. Describe proposed measures to reduce or control emissions or other impacts to air, if any:

Appropriate dust control will be employed if necessary.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, and wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Lake Desire and Peterson Creek Tributary 0328B.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable to the plan itself. Implementation of the lake management plan will attempt to improve the trophic status of Lake Desire through in-lake restoration techniques and watershed control measures. Alum application will occur on the lake and will not have any land surface impacts. Temporary modification of water quality will occur during the alum application process. Construction of the in-lake aeration system will take place during the summer to minimize land and water impacts. Once installed, the aeration system may possibly have a short-term impact on water quality by stirring up the sediments. Separate SEPA compliance will be conducted for in-lake measures.

3) Estimate the amount of fill and dredge material that could be placed in or removed from surface water or wetlands and indicate the area of the site that will be affected. Indicate the source of fill material.

Does not apply.

4) *Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities, if known.*

Does not apply.

5) *Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.*

Does not apply.

6) *Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.*

Does not apply.

b. *Ground:*

1) *Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities, if known.*

Does not apply.

2) *Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: domestic sewage, industrial chemicals, agricultural, etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.*

Does not apply.

c. *Water Runoff (including stormwater):*

1) *Describe the source of runoff (including stormwater) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.*

Not applicable to the plan itself. Stormwater from the compressor building will be minimal and will flow through existing treatment systems, be infiltrated into the ground, or directed to a vegetated area prior to entering the lake depending upon final site design.

2) *Could waste materials enter ground or surface waters? If so, generally describe.*

Not applicable to the plan itself. All implementation activities are designed to improve water quality in and around the lake.

d. *Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:*

Not applicable to the plan itself. The final project plans for in-lake measures will address the possible short-term impacts from construction activities related to the installation of the in-lake aeration system. These impacts are expected to be insignificant compared with the long-term benefits associated with lake aeration.

4. Plants

a. *Check or underline types of vegetation found in the watershed:*

_x_ deciduous tree: alder, maple, aspen, other
_x_ evergreen tree: fir, cedar, pine, other
_x_ shrubs
_x_ grass
_x_ pasture
___ crop or grain
_x_ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
_x_ water plants: water lily, eelgrass, milfoil, other
___ other types of vegetation

b. *What kind and amount of vegetation will be removed or altered?*

Not applicable to the plan itself. If the compressor building is located at the boat launch, no vegetation removal will be needed. If another location is used, as much as 500 square feet of vegetation may require removal.

c. *List threatened or endangered species known to be on or near the site:*

Does not apply.

d. *Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:*

Revegetation of watershed wetlands and lake shoreline with native plants is included among plan recommendations.

5. Animals

a. *Underline any birds and animals which have been observed on or near the site, or are known to be on or near the site:*

___ birds: hawk, heron, eagle, songbirds, other
___ mammals: deer, bear, elk, beaver, other
___ fish: bass, salmon, trout, herring, shellfish, other

b. *List any threatened or endangered species known to be on or near the site:*

Bald eagle.

c. *Is the site part of a migration route? If so, explain.*

The lake and watershed wetlands provide resting sites for waterfowl during annual migration. The lake and wetland also support resident waterfowl populations.

d. *Proposed measures to preserve or enhance wildlife, if any:*

Restoration of the lake shoreline should improve wildlife habitat. In-lake aeration is also expected to improve aquatic habitat.

6. Energy and Natural Resources

a. *What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.*

Not applicable to the plan itself. Electric power will be used to run the on-shore compressor.

b. *Would your project affect the potential use of solar energy by adjacent properties? If so, explain.*

Does not apply.

c. *What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:*

Does not apply.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Does not apply.

1) Describe special emergency services that might be required.

Does not apply.

2) Proposed measures to reduce or control environmental health hazards, if any:

Does not apply.

b. Noise:

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment operation, other)?

Does not apply.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, equipment operation, other)? Indicate what hours noise would come from the site.

Not applicable to the plan itself. Short-term noise would be expected during the construction process for in-lake aeration. Construction activities will likely take place from April-October during normal working hours.

3) Proposed measures to reduce or control noise impacts, if any:

Not applicable to the plan itself. Hours of construction will be limited to comply with local noise ordinances. Long-term, noise will be emitted from the building due to the compressors inside, however, the final noise level is expected to be below local noise thresholds or standards.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

The lake is primarily used for fishing, boating, and swimming. Primary access is to the lake is from the Washington State Department of Fish and Wildlife boat launch operated at the north end of the lake and local resident shoreline access. Access to the lake also occurs from a large open space park which runs along the eastern portion of the lake watershed connecting to the lake at its south eastern end. The properties adjacent to the lake are used for residential or recreational uses. The remaining watershed properties are used primarily for residential uses.

b. Has the site been used for agriculture? If so, describe.

Agricultural activities in the watershed are minimal. There are several animal-keeping operations in the watershed.

c. Describe any structures on the site.

Not applicable to the plan itself. At the proposed location for the compressor building (the boat launch), a fishing pier, paved parking and permanent pit toilets exist.

d. Will any structures be demolished? If so, what?

Does not apply.

e. What is the current zoning classification of the site?

RS-7200-P (six units per acre) or single family residential is the zoning designation in the immediate lake shoreline area. Other zoning designation of lesser density (AR-2.5-P [1 unit per 2.5 acres] and AR-5-P [one unit per five acres]) are present in the remaining portions of the watershed.

f. What is the current comprehensive plan designation of the site?

The King County Comprehensive Plan designates the area immediately around the lake as urban. The remaining portions of the watershed have been designated as urban, rural, or open space.

g. If applicable, what is the current shoreline master program designation of the site?

The entire shoreline is designated rural.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

The northern shoreline area include a portion of Cedar River Wetland 14, a class 1 wetland based on the King County Wetlands Inventory (1990).

i. Approximately how many people would reside or work in the completed project?

Does not apply.

j. Approximately how many people would the completed project displace?

Does not apply.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Does not apply.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high-, middle-, or low-income housing.

Does not apply.

b. Approximately how many units, if any, would be eliminated? Indicate whether high-, middle-, or low-income housing.

Does not apply.

c. Proposed measures to reduce or control housing impacts, if any:

Does not apply.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas? What is the principal exterior building material(s) proposed?

Not applicable to the plan itself. The design for the compressor building has not been completed. It is expected that the structure will not exceed 12 feet in height. Standard materials (concrete, brick, and wood) will be used to construct the compressor building.

b. What views in the immediate vicinity would be altered or obstructed?

Does not apply.

c. Proposed measures to reduce or control aesthetic impacts, if any:

No aesthetic impacts are anticipated. If appropriate, landscaping will be incorporated into the final design for the compressor building site.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Does not apply.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Does not apply.

c. What existing off-site sources of light or glare may affect your proposal?

Does not apply.

d. Describe proposed measures to reduce or control light and glare impacts, if any:

Does not apply.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The boat launch area offers fishing and boating opportunities. A newly constructed fishing pier provides opportunity for shore fishing as well. The open space park along the eastern portion of the lake offers viewpoints of the lake and shoreline access to the lake through a series of wildland trails. Petrovitsky Park to the west of the lake offers both active and passive recreational opportunities including soccer, tennis, softball, baseball, picnicking, and hiking.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No displacement of existing recreational uses would be expected. The plan is expected to enhance recreational uses of the lake by improving lake trophic status.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Does not apply.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

Does not apply.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

Cedar River Wetland 14 was one of the largest peat mines in the history of Washington. Peat coring from the wetland have been used by the scientific community.

c. Describe proposed measures to reduce or control impacts, if any:

Does not apply.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on-site plans, if any.

Access to the lake is via Petrovitsky Road, which passes to the south of the lake. Petrovitsky Road connects with 140th Way SE, a major roadway extending south from Highway 169 approximately 2 miles east of Interstate 405. West Lake Desire Road, a minor road branching off of Petrovitsky Road, provides access to the Washington State Department of Fish and Wildlife operated public boat launch, located on the northern shore of the lake, and the 400 acre open space tract along the south eastern side of the lake (Figure 2).

b. Is the site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Yes. Metro routes 145 and 148 serve the Lake Desire area.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Does not apply.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Does not apply.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Does not apply.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Does not apply.

g. Proposed measures to reduce or control transportation impacts, if any:

Does not apply.

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Does not apply.

b. Proposed measures to reduce or control direct impacts on public services, if any:

Does not apply.

16. Utilities

a. Underline utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity that might be needed.

Not applicable to the plan itself. The compressor building will need to have electrical lines connected to it.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Title: Senior Ecologist

Date Submitted: Feb 28, 1995

SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

I How would the proposal be likely to increase discharge to water; or production of noise?

This proposal will not result in any increases in these categories.

II How would the proposal be likely to affect plants, animals, fish, or marine life ?

This proposal is intended to improve the future environment for aquatic animals and fish by providing a watershed management plan to protect water quality from degradation due to new development in the watershed.

III How would the proposal be likely to deplete energy or natural resources.

This proposal will have no impact on energy or natural resources.

IV How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplain, or prime farmlands ?

The proposal would improve environmentally sensitive areas in a positive manner as this plan is designed to reduce the contamination in vactor waste from entering the environment. This will be done by building vactor waste receiving stations throughout the County thus making it more convenient and cost efficient to dispose of this contaminated waste in an appropriate manner. Issues relating to individual selected sites will be addressed in depth at the time of selection.

V How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans.

This proposal will not affect shorelines of the state.

VI How would the proposal be likely to increase demands on transportation or public services and utilities?

This proposal will reduce traffic on the roadways by providing more vactor waste receiving stations throughout the County thus reducing the driving time and distance for the vactor trucks. This proposal will have no impact on public services or utilities. Any increase flow into the Metro sanitary lines will be so insignificant that no impact will occur.

VII Identify if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

This proposal will increase compliance with federal, state, and local environmental laws and ordinances.

E. Cost/Benefit Analysis

LAKE DESIRE PROPERTY ASSESSMENT IMPACT

INTRODUCTION

The Preferred Alternative watershed improvements will cost approximately $649,000. To pay for the improvement costs a Lake Management District (LMD) has been proposed. The LMD has the authority to assess property taxes on properties located within the LMD. These taxes will be used to pay a portion of the improvements and activity costs. Tax assessments will be combined with other public-private funding methods to pay for the Preferred Alternative.

The following analysis assesses the impact the improvements may have on the property values located in the LMD. The analysis focuses on the 126 shoreline properties surrounding Lake Desire. The principal concern is whether the benefits derived from the Preferred Alternative equal or exceed the alternative costs. To address that concern it is important to know what portion of property value increases to shoreline properties (1) can be attributable to the Preferred Alternative improvements, and (2) whether the property tax generated from that portion pay for the preferred improvements?

Setting

Preferred Alternative improvements will include in-lake measures, watershed measures, aquatic plant management, and monitoring. These activities will improve the existing lake water quality and prevent future degradation of the watershed and the Lake.

How the Preferred Alternative improvements will impact the property values depends in large part on the perception of the improvements as adding market value to the properties within the watershed. Property values may increase beyond a no action (no improvement) alternative, if property owners and buyers perceive that the improvements contribute to the value of the property. Obvious examples are instances where improvements result in dramatic changes in Lake and watershed quality – eliminating algal blooms, allowing swimming and other recreational activities that have been curtailed, reducing the incidence of water quality related human health problems, reducing odors, improving fisheries, etc. These are some quality of life measures which impact market value and affect property assessments. Presumably, the more dramatic the benefits from the lake improvements the greater the impact on property values.

Degradation of Lake Desire and the surrounding watershed has occurred. Some examples include odor problems, milfoil growth, algal blooms, and aesthetic concerns. However, swimming and lake recreational activities (e.g., boating, fishing, etc.), as well as other activities have continued despite these problems. Property assessment values have also kept pace with the property assessment rates in King County. These two factors imply that while there are problems with Lake Desire's water quality they may not be easily detected in the property value assessments.

The degree that the Preferred Alternative will produce dramatic changes in Lake and watershed activities, may be difficult to measure through property value changes. It is assumed in this analysis, though, that there will be some increase in property value assessments between the No Action and Preferred Alternative.

METHODOLOGY AND ANALYSIS

Methodology

The methodology used for analyzing the property assessment impacts was a comparison of property values with and without implementation of the Preferred Alternative recommendations. The comparison is for a selected time period. The difference between the property values, assuming it is possible to hold all other variables constant, is the quantitative impact from the improvements. The impact is then compared to the cost of the improvements to determine if the benefit as reflected in greater property values exceed the cost. A second evaluation is also made to determine whether the property tax assessment payments can pay for the improvements.

The critical variables in the methodology is the length of the term or number of years that are to be analyzed and the estimated impact on property values that are to be attributed to the improvements; both are somewhat subjective. Ten years have been selected for two reasons. First, the LMD, which can have a life of up to ten years, may exercise server funding sources including bonds. Bonds rely on property taxes for payment and often have a ten year amortization period. Second, the Lake Desire Preferred Alternative improvements are to have a long term effect on the water quality. Second, the five year period for implementing the preferred alternative would not be adequate to reflect the Preferred Alternative property value changes from the water quality improvements.

Estimating the additional value to shoreline property assessments that is attributable to the Preferred Alternative is difficult. Since the analysis is being completed prior to implementation of the Preferred Alternative, it is not possible to measure the actual impact. The typical estimation method is to rely on other lakes and shoreline properties that have undergone similar improvements and use them as a model for the Lake Desire analysis. While there have been a number of other lakes in the region that have undergone water qualify improvements none have had property value evaluations that could be used in this analysis.

Therefore, a range of values attributable to the Preferred Alternative impact on property values is used. The values selected for this analysis range from a minimal 1% increase to annual property values to 3% annual property value increase. The rise in property values was estimated to begin in 1997 after Preferred Alternative implementation.

The annual rate of property value change is held constant. In reality the rates will probably fluctuate over the ten year study period. It is unlikely, though, that property value changes would lessen the beneficial impact from the Preferred Alternative unless the improvements are unable to maintain Lake Desire water quality and the lake further degrades. A more likely scenario would be that under the No Action Alternative Lake

Desire degradation would continue and depress property values. This would increase the property value benefit from the Preferred Alternative.

Shoreline Parcels: Existing Conditions

The 126 shoreline property values have been analyzed because they are most sensitive to changes in lake quality. The remaining properties in the watershed may also experience property value changes due to the Preferred Alternative, but the degree of change would be more difficult to measure.

Currently, the 126 parcels along Lake Desire's shoreline account for about 26% of the total assessed value of the watershed or about $17.5 million of $64.1 million (1993 assessed value). However, the benefit from the Preferred Alternative Improvements. 1989 and 1993, shoreline property values increased about the same rate as King County properties -- experiencing a sharp increase in the 1989-1990 period and then smaller annual increases since 1990. King County has averaged about four-five percent between 1989-1993, while Lake Desire's average for the same period has been over four percent (Table 1).

Forecasting

Three 10 year forecasts have been completed for the shoreline parcels. One forecast is for the No Action alternative. The No Action Alternative assumes no water quality improvements will be implemented during the 10 year period -- property values will be increasing at a 4% annual rate. A second forecast is for the Preferred Alternative to add a 1% annual increase in shoreline property assessments above the No Action Alternative -- shoreline property values will rise at a 5% annual rate. The third forecast is for the Preferred Alternative with a 3% annual increase in shoreline property assessments above the No Action Alternative -- shoreline property values will rise at a 7% annual rate.

The property value results from the forecast are displayed in Table 1. By the year 2006 property assessments will be approximately $30.4 million for the No Action Alternative and between $40.9 million to $48.8 million for the Preferred Alternative. The Preferred Alternative results in an increase in shoreline property values by 2006 of $10.5 to $18.4 million compared to the No Action Alternative.

The comparative annual differences between the No Action and Preferred Alternatives are also important. Table 2 displays the incremental change in annual shoreline property values for the No Action and Preferred Alternatives. By taking the difference between the No Action and the Preferred Alternatives it is possible to calculate the annual benefit in shoreline property assessments attributed to the Preferred Alternative. The benefits range from a low of $187 thousand in 1997 to a high of $9.1 million by 2006.

Analysis and Results

The final step of the analysis is to compare the forecasts with the Preferred Alternative improvement costs. The Preferred Alternative capital improvement costs and activities

are $649 thousand. While Lake Desire shoreline properties account for about 26% of the total assessed value of the watershed, it is assumed that shoreline properties will receive a disproportionate share of the benefit from Preferred Alternative improvements. Therefore, shoreline properties will pay a larger share of the Preferred Alternative improvement costs. For purposes of this analysis, 2/3 of the Preferred Alternative improvement costs will be paid by the shoreline properties. This figure is based upon King County Surface Water Management's experience with LMD formation at Beaver Lake. where 2/3 of the cost is to be paid by the shoreline parcels. Shoreline property share of the Preferred Alternative costs will be about $432.7 thousand.

The 10 year cumulative benefit to shoreline property values (Table 2) that is attributable to the Preferred Alternative improvements exceed the cost of the Preferred Alternative ($432.7 thousand). By 2006 the total improvement benefit to shoreline property values ranges from $13.4 million to $29.5 million. Annual benefits to shoreline property values in the initial two years (1997 and 1998) for the 5% Preferred Alternative is below the Preferred Alternative costs but rise above the improvement costs beginning in 1999.

Paying for the cost of the project through taxes on the increased value of the property is a function of the revenues that can be generated by the tax levy. While the additional property values exceed the project cost, it still may not be possible to raise sufficient taxes to pay for the improvements.

For this comparison it is assumed that the capital costs will be funded at one time by a single financial instrument. The LMD has borrowing and bonding authority so a ten year bond has been selected for the analysis with a yield or interest rate of 8.45% (closing utility bond rate for January 26, 1995). Semi-annual payments (two/year) will be made to retire the bond. The total semi-annual payment is $34,903 or about $65,806/year for all the Preferred Alternative improvement. The 2/3 portion to be paid by the shoreline property owners is $23,268 semi-annually or $45,537 annually.

Table 3 displays the total bond cost with interest, the 2/3 portion to be paid by the Lake Desire shoreline properties, the range of annual tax assessments per $1,000 assessed value necessary to cover the $45.5 thousand annual bond payment, and an example of the typical tax assessment to be paid by a shoreline property with a $250 thousand assessed value.

Under this scenario, property assessment rate per $1,000 would be adjusted annually to pay the bond. As property values increased (Table 2) the assessment rate would decline. Property tax rates as presented in Table 3 would range from a high of $2.32/$1,000 to $2.37/$1,000 assessed value in 1997 to a low of $1.26/$1,000 to $1.53/$1,000 assessed value by 2006.

An example has been included to calculate the typical cost to an individual shoreline property. If a shoreline property has a $250 thousand assessed value in any year of the amortization period, the property will be taxed the amount that is displayed in Table 3. The cost to a property in 1997 will range from $580.54 to $591.60 and decline by the year 2006 to between $315.78 to $381.35.

Conclusion

The results that are presented in this analysis indicate that the property tax benefit derived from the Preferred Alternative exceed the costs of the Preferred Alternative improvements and activities (Table 2). Under the taxing scheme analyzed and displayed in Table 3, tax assessment rates are adjusted so shoreline properties pay a 2/3 share of the Preferred Alternative improvements and activities ($465.3 thousand).

There are a number of variables that could affect the analysis presented and revenue generated from the property tax. Among them are the following.

- Higher property values to shoreline properties than attributed to the Preferred Alternative in this analysis could reduce the tax rate per $1,000 assessed value,

- Longer amortization period could lower the semi-annual payment and lengthen the time period for paying the bond, and

- Higher than expected impact on remaining watershed property values could increase the tax revenue generation.

Adjustments or changes in any one or combination of the variables will have an impact on the potential revenue generation.

In addition, further study using a comparative analysis would provide more definitive results regarding the benefit/cost analysis. For example, another lake which has previously undergone water quality improvements could be used as a model. Thus, refining the estimated impact on property values in the Lake Desire watershed resulting from improved water quality.

TABLE 2: LAKE DESIRE SHORELINE PROPERTY ASSESSMENT COMPARISON

YEAR	No Action Alt.: Annual Change in Property Assessment 4%/Yr. (1994 $)	Alt.: Annual Change in Property Assessment 5%/Yr. (1994 $)	Annual Difference Btw. NA & 5%	Alt.: Annual Change in Property Assessment 7%/Yr. (1994 $)	Annual Difference Btw. NA & 7%
1996*	$18,729,366	$18,729,366		$18,729,366	
1997**	$749,174	$936,467	$187,294	$1,311,056	$561,882
1998**	$1,528,314	$1,919,758	$391,444	$2,713,885	$1,185,571
1999**	$2,338,620	$2,952,213	$613,593	$4,214,913	$1,876,292
2000**	$3,181,339	$4,036,291	$854,952	$5,821,012	$2,639,673
2001**	$4,057,766	$5,174,573	$1,116,807	$7,539,539	$3,481,773
2002**	$4,969,250	$6,369,769	$1,400,519	$9,378,362	$4,409,112
2003**	$5,917,194	$7,624,725	$1,707,531	$11,345,903	$5,428,709
2004**	$6,903,055	$8,942,428	$2,039,373	$13,451,172	$6,548,116
2005**	$7,928,351	$10,326,017	$2,397,666	$15,703,809	$7,775,458
2006**	$8,994,659	$11,778,785	$2,784,126	$18,114,131	$9,119,473
10 Year Cumulative A.V.	$46,567,722	$60,061,025	$13,493,303	$89,593,781	$43,026,058
10 Year Cumulative Benefit			$13,493,303		$29,532,687

Note: percentage figure in column heading refers to property value annual increase.
*Beginning Assessed Value
**Annual Assessed Value Change.

TABLE 3: PREFERRED ALTERNATIVE COST AND PROPERTY TAX COMPARISONS*

YEAR	Total Annual Bond Payment	Shoreline Portion of Bond Payment (2/3 Total Cost)	Tax Per $1,000 AV: 5% Preferred Alt.	Preferred Alt. Property Tax: Property = $250K AV**	Tax Per $1,000 AV: 7% Preferred Alt.	Example: 7% Preferred Alt. Property Tax: Property = $250K AV**
1997	$69,806	$46,537	$2.37	$591.60	$2.32	$580.54
1998	$69,806	$46,537	$2.25	$563.43	$2.17	$542.56
1999	$69,806	$46,537	$2.15	$536.60	$2.03	$507.07
2000	$69,806	$46,537	$2.04	$511.05	$1.90	$473.90
2001	$69,806	$46,537	$1.95	$486.71	$1.77	$442.89
2002	$69,806	$46,537	$1.85	$463.54	$1.66	$413.92
2003	$69,806	$46,537	$1.77	$441.46	$1.55	$386.84
2004	$69,806	$46,537	$1.68	$420.44	$1.45	$361.53
2005	$69,806	$46,537	$1.60	$400.42	$1.35	$337.88
2006	$69,806	$46,537	$1.53	$381.35	$1.26	$315.78
10 Year Cumulative	$698,060	$465,373		$4,796.60		$4,362.92

*1994 dollars

**AV = Assessed value.

TABLE 1: LAKE DESIRE SHORLINE PROPERTY TAX ASSESSMENT COMPARISONS

PARCEL NUMBER	1994 Assessed Value (1994 $)	1993 Assessed Value (1994 $)	1991 Assessed Value (1994 $)	1989 Assessed Value (1994 $)	% Change Assessed Value 1989-95 (1994 $)	2006 Property Value No Action: 4% Rise AV (1994 $)	2006 Property Value Preferred Alt. 5% Rise AV (1994 $)	2006 Property Value Preferred Alt. 7% Rise AV (1994 $)
SE 25 23 05								
252305-9031	67,132	61,464	44,830	31,771	8%	$142,547	$181,742	$218,047
252305-9018	171,288	168,792	127,835	102,961	6%	$295,922	$362,738	$436,822
252305-9030	161,044	158,704	136,123	114,581	4%	$228,024	$269,111	$325,263
252305-9033	84,136	85,072	61,991	48,980	6%	$156,159	$194,052	$233,380
(BLOCK 4)						$0	$0	$0
400840-0225	330,668	325,832	282,287	242,842	3%	$451,644	$529,384	$640,272
400840-0235	150,592	148,408	116,043	89,282	6%	$264,302	$324,953	$391,207
400840-0240	187,668	184,912	157,021	136,056	3%	$260,085	$305,698	$369,632
400840-0245	185,952	183,248	155,153	123,112	4%	$286,392	$343,454	$414,472
400840-0250	154,388	152,152	120,246	95,901	5%	$256,117	$311,526	$375,429
400840-0255	223,860	220,584	197,064	120,759	8%	$461,911	$585,711	$703,072
400840-0260	172,276	202,280	147,448	121,494	6%	$304,324	$374,622	$450,950
400840-0270	165,932	163,488	135,073	104,579	5%	$270,789	$328,344	$395,816
400840-0275	19,500	23,400	17,045	10,443	10%	$50,808	$67,359	$80,522
400840-0280	13,104	16,848	12,258	5,736	15%	$53,538	$77,353	$91,758
400840-0285	13,104	16,848	12,258	5,736	15%	$53,538	$77,353	$91,758
400840-0290	13,104	16,848	12,258	5,736	15%	$53,538	$77,353	$91,758
400840-0295	1,040	1,040	12,258	5,736	2%	$1,295	$1,491	$1,807
(BLOCK 5)						$0	$0	$0
400840-0300	13,104	16,848	12,258	5,736	15%	$53,538	$77,353	$91,758
400840-0305	10,608	10,608	12,258	5,736	10%	$27,572	$36,536	$43,678
400840-0310	13,312	17,264	12,608	6,031	15%	$52,010	$74,505	$88,446
400840-0315	13,728	18,096	13,192	6,619	14%	$49,343	$69,567	$82,701
400840-0320	13,728	18,096	13,192	6,619	14%	$49,343	$69,567	$82,701
400840-0325	13,728	18,096	13,192	6,619	14%	$49,343	$69,567	$82,701
400840-0330	53,664	54,288	39,576	26,476	9%	$123,196	$159,427	$191,009
400840-0335	38,532	45,344	33,039	7,354	39%	$1,011,496	$2,089,314	$2,408,579
400840-0340	43,004	54,288	39,576	26,476	9%	$98,724	$127,758	$153,066
400840-0345	162,656	160,264	140,676	115,170	4%	$231,828	$273,944	$331,063
400840-0350	272,220	268,216	246,213	211,953	3%	$348,806	$403,904	$489,092
400840-0360	86,840	86,840	100,867	88,105	0%	$87,343	$96,587	$117,498
400840-0365	217,100	213,928	189,592	154,589	4%	$307,660	$363,156	$438,924

TABLE 1: LAKE DESIRE SHORLINE PROPERTY TAX ASSESSMENT COMPARISONS

PARCEL NUMBER	1994 Assessed Value (1994 $)	1993 Assessed Value (1994 $)	1991 Assessed Value (1994 $)	1989 Assessed Value (1994 $)	% Change Assessed Value 1989-95 (1994 $)	2006 Property Value No Action: 4% Rise AV (1994 $)	2006 Property Value Preferred Alt. 5% Rise AV (1994 $)	2006 Property Value Preferred Alt. 7% Rise AV (1994 $)
400840-0370	81,224	81,224	81,838	68,837	2%	$97,217	$111,123	$134,733
						$0	$0	$0
NE 36 23 05						$0	$0	$0
362305-9031	360,880	355,576	327,934	305,942	2%	$421,370	$479,377	$581,502
362305-9004	4,784	5,408	26,384	19,857	-5%	$2,968	$2,994	$3,677
(BLOCK 1)						$0	$0	$0
400840-0005	103,064	117,728	85,807	72,808	6%	$176,139	$215,463	$259,520
400840-0010	104,520	119,600	87,208	74,279	5%	$177,774	$217,265	$261,713
400840-0015	235,664	232,232	206,520	187,095	2%	$295,350	$340,565	$412,567
400840-0020	106,288	121,368	89,192	76,044	5%	$178,760	$218,003	$262,656
400840-0025	93,288	90,168	66,077	26,476	19%	$513,806	$786,064	$927,854
400840-0030	53,768	59,696	43,545	37,066	5%	$91,469	$111,793	$134,663
400840-0035	53,768	59,696	43,545	37,066	5%	$91,469	$111,793	$134,663
400840-0040	198,016	195,104	169,512	138,556	4%	$285,973	$338,776	$409,313
400840-0045	74,464	76,128	55,453	29,123	13%	$247,657	$344,011	$409,502
400840-0050	84,708	97,656	71,214	58,247	6%	$150,833	$185,957	$223,813
400840-0055	84,188	97,656	71,214	58,247	6%	$149,907	$184,816	$222,439
400840-0060	95,836	111,592	81,371	68,396	6%	$165,433	$202,755	$244,168
400840-0065	183,144	180,440	153,051	126,495	4%	$268,215	$318,585	$384,818
400840-0071	90,740	103,480	75,417	62,512	6%	$159,242	$195,781	$235,699
400840-0075	202,956	199,992	178,151	127,231	5%	$337,849	$411,210	$495,530
400840-0080	93,288	108,576	79,152	66,189	6%	$162,025	$198,809	$239,390
400840-0085	93,288	108,576	79,152	66,189	6%	$162,025	$198,809	$239,390
400840-0095	347,984	373,568	278,901	174,593	9%	$852,094	$1,116,354	$1,335,969
400840-0100	279,604	275,496	258,705	216,366	3%	$361,631	$419,500	$507,889
400840-0105	62,400	62,400	79,152	66,189	0%	$61,421	$67,643	$82,322
400840-0110	226,824	223,496	204,535	185,036	2%	$275,978	$316,438	$383,553
400840-0115	266,916	263,016	245,396	197,392	3%	$363,970	$426,485	$515,836
400840-0120	20,800	20,800	23,349	46,333	-6%	$11,141	$10,932	$13,465
400840-0125	100,880	100,880	105,653	76,486	3%	$140,411	$165,172	$199,700
400840-0130	171,808	169,312	143,712	117,376	4%	$254,932	$303,564	$366,585
(BLOCK 2)						$0	$0	$0
362305-9024	258,856	245,960	197,764	175,328	4%	$372,859	$441,483	$533,431
362305-9022	291,720	287,456	222,397	199,009	4%	$436,010	$519,903	$627,754

TABLE 1: LAKE DESIRE SHORLINE PROPERTY TAX ASSESSMENT COMPARISONS

PARCEL NUMBER	1994 Assessed Value (1994 $)	1993 Assessed Value (1994 $)	1991 Assessed Value (1994 $)	1989 Assessed Value (1994 $)	% Change Assessed Value 1989-95 (1994 $)	2006 Property Value No Action: 4% Rise AV (1994 $)	2006 Property Value Preferred Alt. 5% Rise AV (1994 $)	2006 Property Value Preferred Alt. 7% Rise AV (1994 $)
362305-9020	297,752	293,384	229,052	206,217	4%	$437,197	$519,559	$627,545
362305-9026	165,204	154,856	134,372	110,757	4%	$236,586	$279,821	$338,135
362305-9034	263,900	260,000	229,519	189,302	3%	$370,554	$436,628	$527,816
362305-9089	204,880	201,864	216,794	154,883	3%	$283,703	$333,405	$403,139
362305-9002	338,104	333,112	298,865	296,970	1%	$381,305	$430,940	$523,091
362305-9099	344,500	339,456	305,869	291,233	2%	$403,788	$459,708	$557,602
(BLOCK 3)						$0	$0	$0
400840-0200	184,808	182,104	161,690	124,142	4%	$281,209	$336,462	$406,125
400840-0205	84,240	90,480	65,960	52,952	6%	$153,357	$189,868	$228,429
400840-0210	181,844	179,192	158,422	137,233	3%	$240,967	$280,820	$339,835
400840-0215	89,440	90,480	65,960	52,952	6%	$162,823	$201,589	$242,529
400840-0220	84,240	90,480	65,960	52,952	6%	$153,357	$189,868	$228,429
						$0	$0	$0
362305-9019	288,340	284,128	250,533	232,840	2%	$354,975	$407,930	$494,339
362305-9069	180,024	210,288	153,285	140,616	5%	$282,792	$340,415	$410,655
362305-9029	250,172	246,480	217,727	199,892	2%	$311,381	$358,580	$434,447
362305-9101	201,084	198,120	212,824	193,714	0%	$207,108	$230,063	$279,743
362305-9025	74,880	74,880	88,375	75,456	0%	$76,278	$84,555	$102,836
(BLOCK 6)						$0	$0	$0
400840-0375	217,828	214,656	192,511	154,589	4%	$310,352	$366,708	$443,172
400840-0380	76,908	97,656	71,214	58,247	6%	$136,944	$168,834	$203,204
400840-0385	150,696	148,512	121,180	66,631	10%	$406,871	$543,093	$648,819
400840-0390	76,908	97,656	71,214	58,247	6%	$136,944	$168,834	$203,204
400840-0395	132,132	147,784	107,755	81,634	7%	$257,858	$323,509	$388,721
400840-0400	167,908	165,464	129,469	105,021	5%	$276,335	$335,608	$404,510
400840-0410	115,752	114,088	104,603	62,659	8%	$240,812	$305,832	$367,059
400840-0415	42,484	43,368	31,638	26,182	6%	$74,600	$91,728	$110,429
400840-0420	45,240	48,880	35,607	29,123	6%	$80,666	$99,477	$119,725
400840-0425	134,992	133,016	103,785	78,986	6%	$240,752	$296,906	$357,337
400840-0430	52,884	53,768	39,226	32,653	6%	$92,236	$113,266	$136,375
						$0	$0	$0
362305-9087	252,148	248,456	224,032	184,889	3%	$345,748	$405,563	$490,479
362305-9075	51,064	54,288	79,152	66,189	-1%	$45,335	$48,959	$59,702
(BLOCK 7)						$0	$0	$0

TABLE 1: LAKE DESIRE SHORLINE PROPERTY TAX ASSESSMENT COMPARISONS

PARCEL NUMBER	1994 Assessed Value (1994 $)	1993 Assessed Value (1994 $)	1991 Assessed Value (1994 $)	1989 Assessed Value (1994 $)	% Change Assessed Value 1989-95 (1994 $)	2006 Property Value No Action: 4% Rise AV (1994 $)	2006 Property Value Preferred Alt. 5% Rise AV (1994 $)	2006 Property Value Preferred Alt. 7% Rise AV (1994 $)
400840-0435	61,880	61,880	85,807	72,808	-1%	$55,945	$60,626	$73,903
400840-0440	168,116	165,672	136,123	107,080	5%	$270,809	$327,555	$394,959
						$0	$0	$0
362305-9027	71,604	69,368	77,868	77,809	-1%	$64,210	$69,473	$84,702
(BLOCK 8)						$0	$0	$0
400840-0445	85,488	108,576	79,152	66,189	6%	$148,478	$182,186	$219,374
400840-0450	200,876	197,912	171,614	150,765	3%	$267,749	$312,379	$377,985
400840-0455	190,112	187,304	159,706	136,791	3%	$265,674	$312,763	$378,115
400840-0460	209,924	206,856	182,354	164,297	2%	$267,222	$309,046	$374,274
400840-0465	185,328	182,624	155,153	126,054	4%	$276,422	$329,479	$397,843
400840-0470	43,680	38,480	28,019	35,742	2%	$51,057	$58,098	$70,473
400840-0475	57,096	76,128	55,453	42,361	7%	$110,430	$138,309	$166,216
400840-0480	225,784	222,456	200,566	181,800	2%	$278,584	$320,278	$388,105
400840-0485	212,784	209,664	185,506	165,915	2%	$271,932	$314,729	$381,128
400840-0490	173,420	170,872	125,150	95,019	7%	$335,589	$420,354	$505,164
400840-0495	85,488	108,576	79,152	66,189	6%	$148,478	$182,186	$219,374
400840-0505	150,904	148,720	140,910	135,615	1%	$165,782	$186,430	$226,408
400840-0510	169,416	166,920	141,027	109,580	5%	$268,325	$323,506	$390,199
400840-0515	193,232	190,424	148,965	138,115	4%	$274,387	$324,006	$391,591
400840-0520	219,648	216,424	196,597	177,829	2%	$269,432	$309,413	$374,979
						$0	$0	$0
362305-9112	78,520	90,480	24,516	0	45%	$3,191,344	$7,172,208	$8,218,725
362305-9045	60,008	59,696	25,567	63,101	7%	$122,541	$155,076	$186,183
362305-9092	24,440	28,080	20,430	13,973	8%	$54,576	$70,254	$84,213
362305-9023	24,440	28,080	20,430	13,973	8%	$54,576	$70,254	$84,213
362305-9113	30,576	36,192	0	0	4%	$45,260	$53,869	$65,056
362305-9021	26,312	29,744	21,714	15,297	8%	$56,245	$71,802	$86,135
						$0	$0	$0
SE 36 23 05						$0	$0	$0
(BLOCK 1)						$0	$0	$0
401080-0005	48,984	54,288	39,576	33,095	6%	$85,077	$104,391	$125,700
401080-0010	215,228	212,056	188,191	168,562	2%	$273,704	$316,482	$383,287
401080-0015	199,992	197,080	171,380	150,618	3%	$265,608	$309,668	$374,730
401080-0021	124,644	155,688	113,475	100,608	5%	$203,012	$246,069	$296,645

TABLE 1: LAKE DESIRE SHORLINE PROPERTY TAX ASSESSMENT COMPARISONS

PARCEL NUMBER	1994 Assessed Value (1994 $)	1993 Assessed Value (1994 $)	1991 Assessed Value (1994 $)	1989 Assessed Value (1994 $)	% Change Assessed Value 1989-95 (1994 $)	2006 Property Value No Action: 4% Rise AV (1994 $)	2006 Property Value Preferred Alt. 5% Rise AV (1994 $)	2006 Property Value Preferred Alt. 7% Rise AV (1994 $)
401080-0027	39,520	39,520	40,860	59,570	-3%	$27,765	$28,680	$35,135
401080-0035	78,832	78,832	88,492	113,846	-3%	$56,251	$58,278	$71,372
401080-0040	188,292	185,536	158,422	137,968	3%	$257,856	$302,391	$365,714
401080-0045	214,812	211,640	187,724	160,178	3%	$288,512	$337,093	$407,830
401080-0050	90,116	88,296	98,664	70,602	3%	$119,075	$138,693	$167,848
401080-0055	87,724	105,352	76,934	64,130	6%	$152,571	$187,258	$225,475
401080-0060	201,708	198,744	174,649	154,295	3%	$263,255	$305,908	$370,300
401080-0065	221,312	224,744	193,795	149,147	5%	$346,681	$417,101	$503,190
401080-0070	238,004	234,520	204,769	185,183	3%	$304,979	$353,157	$427,642
(BLOCK 2)						$0	$0	$0
382305-9032	64,012	85,384	62,225	49,274	6%	$118,479	$147,151	$176,982
TOTAL	$17,205,292	$17,526,080	$14,870,261	$12,464,495		$30,407,761	$40,959,978	$48,845,889

F. Engineering Analysis

Date: May 4, 1995

To: Sharon Walton, King County Surface Water Management Division

c: *Central Files*

From: Harry L. Gibbons

Project No.: 2390026-022

Subject: Lake Desire Hypolimnetic Aerator Engineering Analysis

Following is our engineering analysis of the Hypolimnetic Aerator at Lake Desire.

LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS KING COUNTY SURFACE WATER MANAGEMENT DIVISION

INTRODUCTION

The draft Lake Desire Management Plan was issued for review in January 1995. The management plan evaluated the Lake Desire watershed and presented several recommendations for enhancing water quality in the watershed. The preferred long term in-lake activity recommended in the management plan was hypolimnetic aeration. Aeration was recommended for the following reasons:

- It is cost effective for reducing the internal loading of phosphorus.
- It is beneficial to aquatic habitat.
- Minimal permitting problems are associated with implementation compared with other in-lake measures.
- In combination with watershed controls, lake trophic status goals can be met.

This engineering analysis will develop design criteria, analyze alternatives, size facilities, and estimate costs for the recommended alternative.

DESIGN CRITERIA

Physical Characteristic

The design criteria for a hypolimnetic aeration system must consider physical lake characteristics of Lake Desire and oxygen depletion rates. Relevant physical characteristics are shown in Table 1. The bathymetric contours are shown in Figure 1.

As shown in Figure 1, the lake bottom is separated into two basins divided by a slight rise. The maximum depth in the north basin is 6.5 meters and the maximum depth in the south basin is

approximately 4.5 meters. The slight rise that separates the two basins is at a depth on 3.5 meters. This topographic feature raises concerns about the flow between the two basins. A major consideration in the design is, with a single aerator placed at the deepest point in the north basin, whether interbasin flow would be sufficient to aerate the south basin.

Our opinion is based on experience from observing the diffusion of oxygen in other hypolimnetic aeration systems, that there will not be sufficient interbasin flow to aerate the south basin. Furthermore, if additional mixing energy is added to the system to create interbasin flow, the potential for destratifying the lake increases. The rise between the basins is at a depth of approximately 3.5 meters. As the thermocline depth varies from 2 to 4 meters, and creating flow across the rise between the basins may disturb the thermocline. It is recommended that an aerator be placed in each basin. The aerators would be located in the central portion, at the deepest point, in both north and south basins. Figure 1 shows the proposed locations for the two aerators.

The hypolimnetic volume (i.e., the area below 3 meters depth) of the north basin is 162,000 m^3. The hypolimnetic volume of the south basin is 124,000 cubic meters. The aerators can be the same size and have sufficient aeration capacity to meet the design goal of 2 mg O2/L. Although the basins have different volumes, the hypolimnetic areas of the two basins are roughly equal.

TABLE 1
LAKE DESIRE PHYSICAL CHARACTERISTICS

Lake volume	1,147,155 m^3
Hypolimnetic volume	290,430 m^3
Surface area	287,328 m^2
Mean depth	4 m
Maximum depth	6.5 m
Thermocline depth	2-4 m
Watershed area	335 hectares

The maximum depth in the south basin is approximately 4.5 meters. The air and water flows through the south basin aerator must be limited to reduce the possibility of destratifying this portion of the lake. It may be advisable to install a control structure to maintain lake levels during the summer months.

Oxygen Depletion Rate

Figures 2 and 3 show the temperature and dissolved oxygen profiles for Lake Desire from data collected in 1993 and 1994. These data indicate that the dissolved oxygen levels drop to less than 2 milligrams per liter (mg/L) from May through September. This oxygen level is too low

to support most animal life. The hypolimnetic aeration system is designed to provide enough oxygen to the lake to keep oxygen levels above 2 mg/L. Higher oxygen levels will minimize the internal cycling of phosphorus. The hypolimnetic volume was estimated to be 290,430 m^3 based on temperature and oxygen data. The estimate of the maximum oxygen depletion rate was based on the oxygen data. During the period of peak oxygen demand the oxygen level dropped 3.0 mg/L in 14 days. This corresponds to an oxygen depletion rate of 0.214 mg O_2 per day per liter. Taken over the entire hypolimnetic volume this results in an oxygen demand of 62.2 kilograms O_2 per day. Due to the limited data on which this estimate is based, it is prudent to add a safety factor when sizing the aerator. The aerators will be sized to provide a total of 100 kilograms O_2 per day.

ALTERNATIVES ANALYSIS

There are two general types of hypolimnetic aerators, a full lift aerator and a partial lift aerator. In a full lift aerator (Figure 4) air is injected into the riser tube which lifts the water to the lake surface and oxygenates it before the water is degassed and returned to the hypolimnion. A partial lift aerator (Figure 5) operates much like the full lift aerator except that the water is degassed in a chamber beneath the water surface before it returns to the hypolimnion. The relative shallow depth and the design constraints, in terms of vertical depth required, favors the full lift system over the partial lift system.

The potential concerns regarding the shallow depth include:

- Increased hypolimnetic turbidity due to disruption of the bottom sediments
- Hypolimnetic warming resulting in destratification
- Increase in the hypolimnetic volume which can lead to destratification
- Increased water movement caused by the aerator which may lead to destratification.

Several elements can be incorporated into the design to prevent these effects from occurring. The elements include positioning the aerators at the deepest portion of each basin; splitting and directing the outlet flow parallel to the lake bottom; and installing insulating foam on the inlet and outlet tubes to minimize heat transfer to the hypolimnion, to use a conservatively large volume for the hypolimnion volume in sizing calculations and to incorporate turn down capability in the air supply system.

Aeration System Sizing

The basis for design of a full lift aerator is taken from from a paper by Ken Ashley titled *Oxygen Transfer in Full Lift Hypolimnetic Aeration Systems (1990).* The paper describes the design of a full lift aeration system for St. Mary Lake in British Columbia, Canada. The air flow requirements for St. Mary Lake were calculated to be 200 standard cubic feet per minute (scfm). Results from the Ashley paper indicated that oxygen transfer rates achieved at St. Mary Lake ranged from 23 to 30 percent and averaged 27 percent using fine bubble diffusers with a pore size of 140

microns. The oxygen transfer rate assumed for the Lake Desire aerator will be 20 percent because the shallow depth of the air diffuser placement will reduce the oxygen transfer efficiency.

Air Flow Calculation

The following calculations determine the required air flow to transfer 100 kg of oxygen per day to the lake.

Total oxygen required	100 kg O_2 / 20 % = 500 kg O_2/day
Oxygen content of air	0.189 kg O_2 / kg air
Weight of air required	[500 kg O_2 / day] / [0.189 kg O_2 / kg air] = 2,646 kg air / day
Volume of air required	[2,646 kg air /day] / [0.0367 kg air / cf] = 72,085 cf/day
Air flow rate	[72,085 cf / day] / [1,440 min/day] = 50 cfm

The total air flow rate required is 50 cubic feet per minute (cfm), or 23.6 liters per second. Normally air flow will be split equally between the two aerators. The piping will be arranged so that the air flow rate to the two aerators can be adjusted.

Water Flow Rate Calculation

The water flow rate can be determined by using an empirical equation developed in a paper by Taggart and McQueen, *A Model for Design of Hypolimnetic Aerators* (1982). The equation is based on the air flow rate, height of water in the riser tube, and riser diameter. The equation is as follows:

$$Ql = 5.14(L)^{0.698}(Qg)^{0.459}(5.75)D/2$$

where Ql is the water flow in liters per second (L/s), L is the height of the riser tube in meters (m), Qg is the air flow rate (L/s) and D is the diameter (m). The height of the riser tube is assumed to be 6.5 meters. The air flow rate, Qg, is 11.8 L/s. The riser tube diameter will be assumed to be 1 meter.

The calculated water flow rate for Lake Desire is 139 L/s (12,020 m^3/day). The hypolimnetic volume of the north basin of 162,000 cubic meters will be turned over approximately every 14 days. The hypolimnetic volume of the south basin of 124,000 cubic meters will be turned over approximately every 10 days.

The equation predicts a water velocity of 0.6 feet per second (fps) in the 1-meter diameter riser tube. This is substantially lower than the 2.3 to 3.3 fps observed at St. Mary Lake. The observed water-to-air flow ratio for St. Mary Lake was 15:1. Although the equation predicts a water-to-air flow ratio of 11:1 for Lake Desire, the potential exists for the water flow to be greater than the predictions. While a higher water flow would improve transfer of oxygen to the hypolimnion, it could cause destratification. Therefore, we recommend that the aeration

system have the capability to turn down air flows, especially during the spring when thermal stratification is not as well developed.

Preliminary Design

Figure 6 shows the proposed full lift aerators for Lake Desire. The aerator box and riser tubes will be constructed of fiberglass reinforced plastic (FRP). The top of the aerator box will be covered with aluminum grating. The in-lake portion of the air supply pipeline will be 3-inch diameter high density polyethylene (HDPE). The piping will switch to schedule 40 aluminum in the aerator. The aluminum air piping will be fitted with a circular air header that will hold the porous diffusers. The air header and diffuser assembly will be constructed so that the entire piece can be removed from the surface of the aerator box. The aerator box will be approximately 15 feet by 6 feet; approximately 3 feet will show above the water surface.

If the mixing energy produced by adding 25 scfm to the aerator in each basin is too great, the lake system may become destratified. A way of reducing mixing energy is to reduce the water flow through the aerator by reducing air flow. The problem with this approach is that the reduced air and water flow may not provide sufficient oxygen to the lake to prevent anaerobic conditions in the hypolimnion.

Oxygen Delivery

The amount of oxygen that can be delivered at lower flows can be improved by utilizing a pure oxygen supply to supplement the air stream to the hypolimnetic aerator. Pure oxygen (90%) can be generated through a process called pressure swing adsorption (PSA). PSA systems are being used at Newman Lake in eastern Washington to provide aeration and at Lake Fenwick in Kent to supplement aeration capacity. The predesign air flow rate of 25 scfm per aerator is equivalent to 581 pounds of oxygen per day with the normal ambient 20 percent oxygen content in air. The air flow rates could be reduced when using pure oxygen to address the problem of adding too much mixing energy to the hypolimnion. The gas flow rate can be reduced to 15.5 scfm (1.3 scfm 90% oxygen and 19.1 scfm air) to deliver the equivalent amount of oxygen as the predesign system using 25 scfm of air. This method represents a 22 percent reduction in the air flow.

In addition to being able to deliver the same amount of oxygen at a lower flow rate, the PSA systems would deliver gas with a higher concentration of oxygen. When mixing high purity oxygen and air, the resulting gas has a higher percentage of oxygen which enhances oxygen transfer. Assuming 1.3 scfm 90% oxygen and 19.1 scfm air the resulting gas would have an oxygen content of 25 percent rather than the atmospheric concentration of 20 percent.

Henry's Law states that the saturation pressure of a gas in solution, in this case oxygen, is equal to the partial pressure times the coefficient of absorption (a constant at given pressure and temperature). The partial pressure of oxygen in the air flow is directly proportional to the percentage of oxygen in the air/oxygen mixture. In the example sited above where the oxygen concentration is increased from 20 to 25 percent, the partial pressure of oxygen increases by 32 percent. The saturation concentration (Cs) of oxygen in solution at typical hypolimnetic conditions (5 degrees C) is 12.8 mg/L. At 25 percent oxygen the Cs is raised to 15.6 mg/l. The driving force for oxygen transfer is equal to the difference between the Cs and the concentration in the hypolimnion.

Water flow through the aerator is proportional to the gas flow through inlet tube. At reduced gas flow rates, the water flow through the aerator will decrease. In the example with 15.5 scfm, the water flow through the aerator would be reduced to approximately three fourths of the water flow rate when 20 scfm of air is delivered. However the driving oxygen gradient has been increased by 50 percent. The net increase in oxygen transfer to the hypolimnion is 13 percent at the reduced flow rate based on three fourths of the water flow times 150 percent increased oxygen transfer.

Pure oxygen could be added to the compressed air flow so that the total output of the system would equal 40 scfm during periods of high hypolimnetic oxygen demand. The air and oxygen system would deliver 512 pounds of oxygen per day, or 28 percent more oxygen than the system proposed without the pure oxygen system.

Compressor Requirements

Typically, aeration systems include two air compressors, each capable of supplying the total air flow required. The Lake Desire would require two 10 horsepower (hp) compressors, one for each aerator, and one standby compressor. The standby compressor would act as back-up or would be used to augment the air flow during periods of high hypolimnetic oxygen demand. If installed, the PSA system would require a compressor that operated continuously in addition to the compressors that provide air flow to the hypolimnetic aerator; therefore, the energy use with the PSA system would be higher. A single PSA system could supply oxygen to both aerators. The air system piping can be arranged so that if the hypolimnetic aerator compressor fails the PSA compressor can be used, without producing pure oxygen, to operate the aerator. As the backup compressor could power the PSA system as well, a total of three compressors would be required for the proposed Lake Desire system.

Costs

The cost of installing a PSA oxygen generation system (Table 2) represents a significant investment in terms of the overall project cost.

The additional annual O&M costs associated with operating the oxygen system compressor on a continuous basis is approximately $3,000 per year. Maintenance costs of the oxygen generation equipment includes changing the oil and filters in the system and maintaining coolant levels in the air dryer. The total O&M cost for the complete aeration system is $17,500.

TABLE 2
PRESSURE SWING ADSORPTION SYSTEM COSTS
AIRSEP MODEL AS-160

ITEM	DESCRIPTION	COST
AS-160 Oxygen Generator	2.67 scfm PSA oxygen generator	$7,800
Air Receiver	120 gallon	700
Refrigerated Air Dryer	32 scfm @ 50 F	1,050
Oxygen Surge Tank	80 gallon	500
Oil Filters	Coalescing oil removal	220
Mercoid Switch	Float switch for auto shut down	330
Auto Drains		480
Additional Piping		1,600
Subtotal		$12,560
Installation	60% of Material Cost	7,540
Total		**$20,100**

The construction budget is shown in Table 3. The construction cost estimate does not include engineering, administrative, legal or land acquisition costs. The cost estimate was based on the following assumptions:

- A building site can be found within 500 feet of the lake shore.
- The building site will be centrally located between the north and south basins.
- The building is constructed of concrete and is partially buried.
- No easements are required for the pipeline right-of-way.
- Three-phase electrical power is located with 100 feet of the building site.
- There are no special drainage, soils conditions or landscaping requirements.

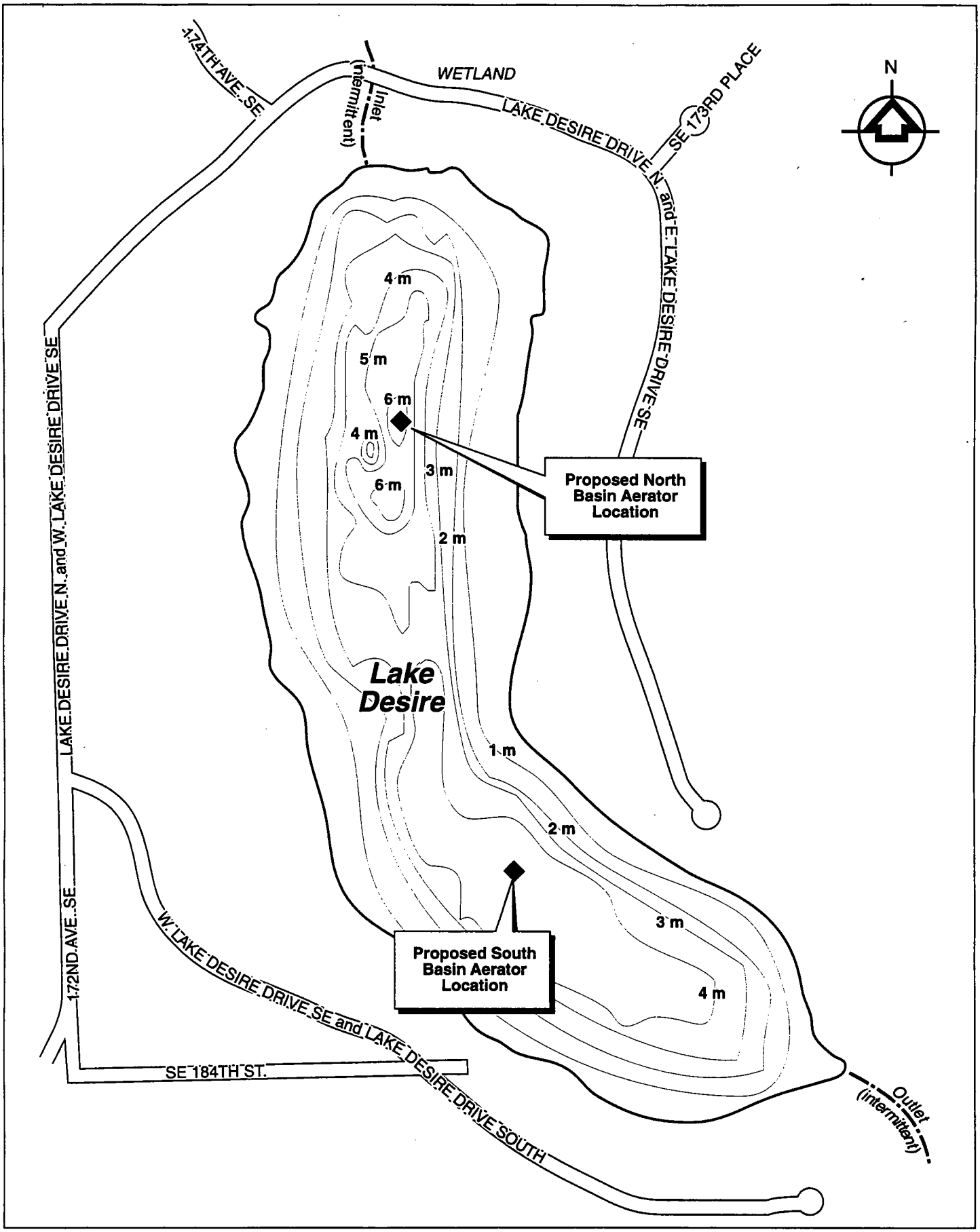
Engineering design and construction services for this project are estimated to be $100,000. The engineering design fees are based on the aeration system recommended by this report. Construction services include bid proposal evaluation and recommendations, attendance at weekly construction meetings, submittal reviews, and pay estimate review.

KCM recommends that the County include a PSA system in the project design for the following reasons:

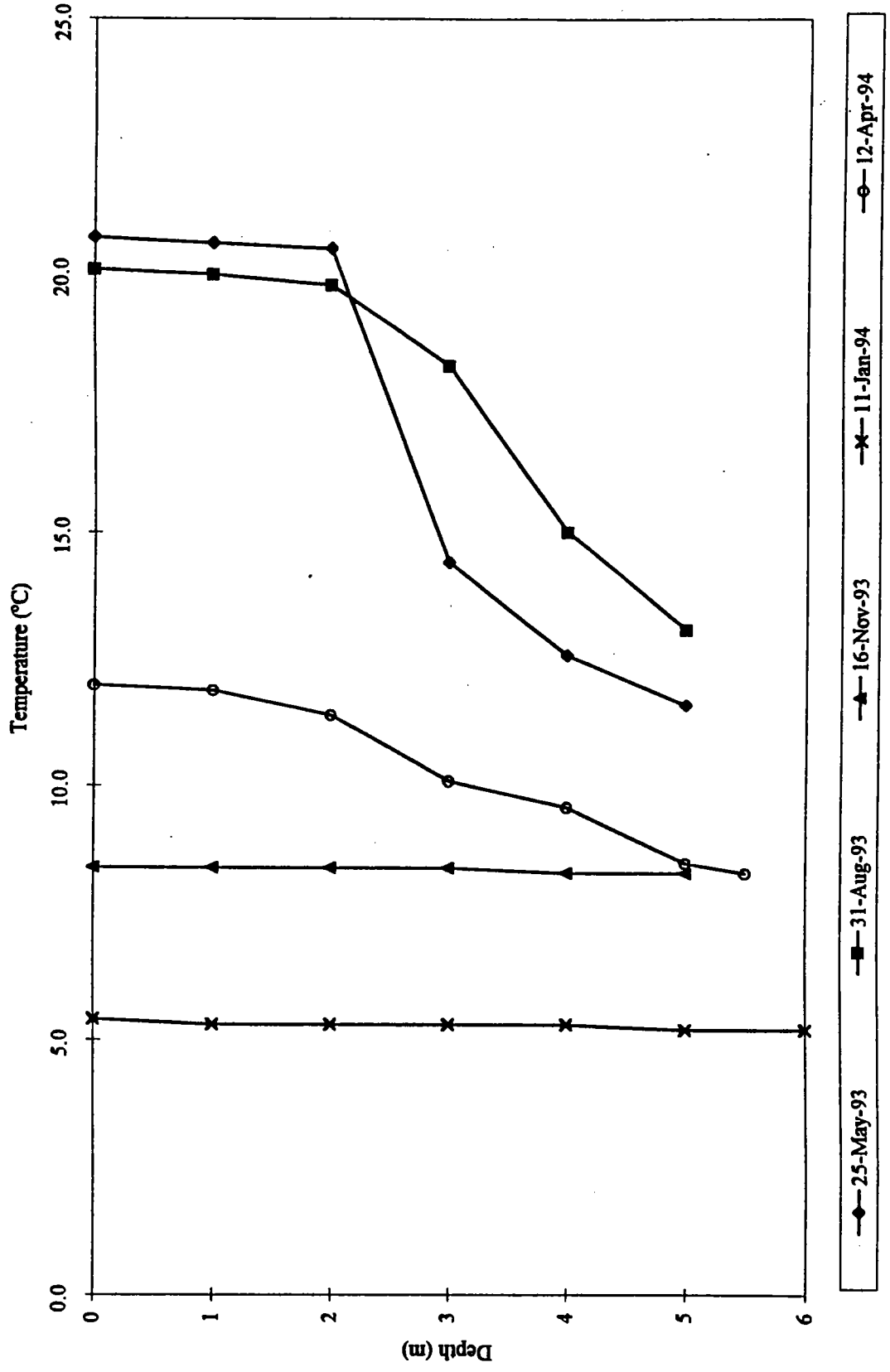
- It is able to transfer an equivalent amount of oxygen to the hypolimnion at a flow rate of 75 percent of the predesign system.
- It has the same general compressor requirements as the predesign system which allows the County to maintain redundant capacity in case one compressor fails.
- It provides a means of reducing mixing intensity in the hypolimnion during periods of weak stratification.

TABLE 3
HYPOLIMNETIC AERATION SYSTEM
PRELIMINARY CONSTRUCTION COST ESTIMATE

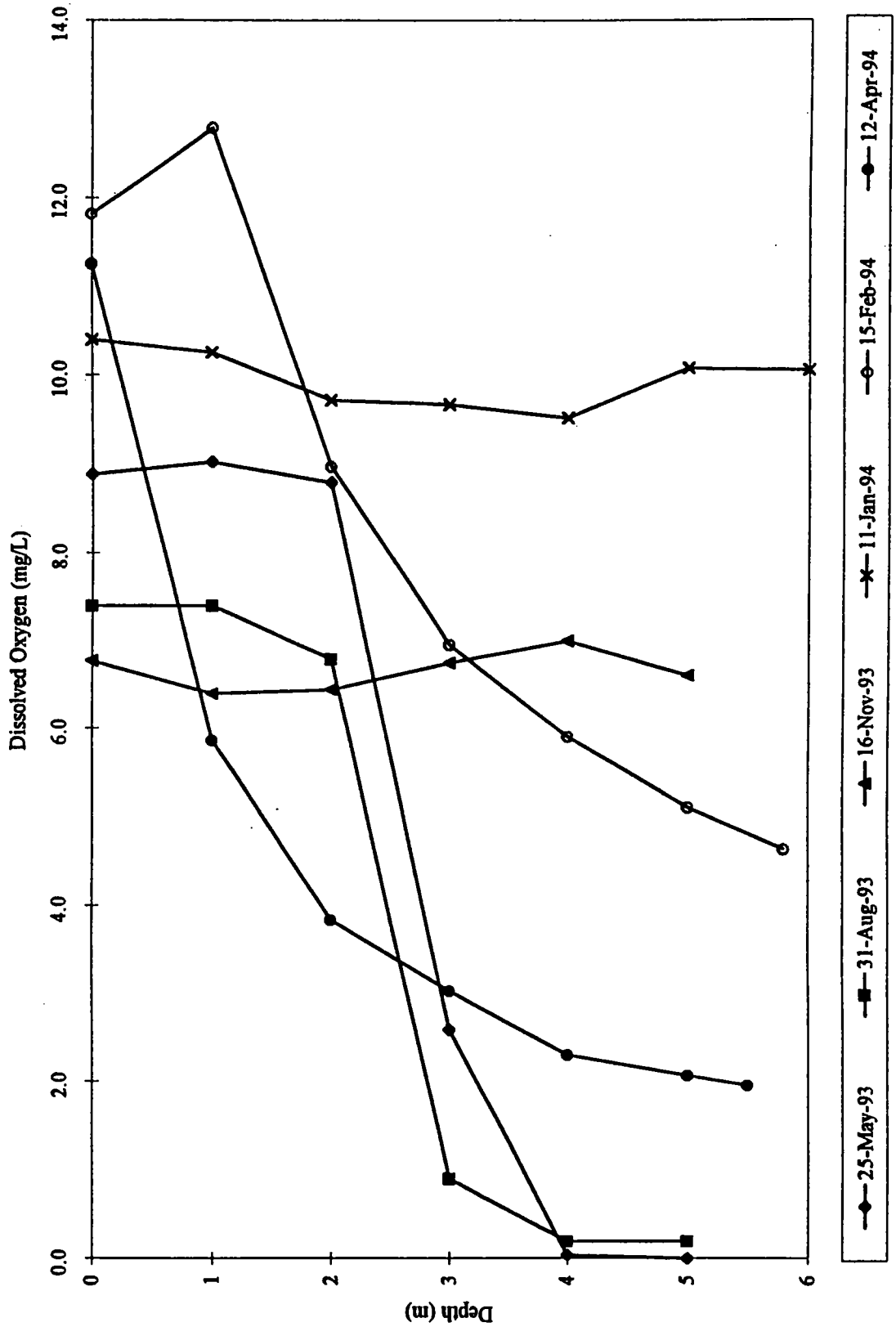
ITEM	APPROXIMATE AMOUNT	COST
Excavation, haul and disposal	120 cubic yards	$1,500
Foundation Material	50 cubic yards	1,000
Building	Lump Sum	65,000
Rotary Screw Compressor system	Three 10 hp compressors and piping	36,000
PSA Oxygen System	Lump Sum	20,100
Acoustical board	Lump Sum	500
Electrical	Lump Sum	8,000
Heating and Air Conditioning	Lump Sum	2,500
Final grading and landscaping	Lump Sum	3,000
3" dia. pipeline	500 lineal feet	6,500
3" Butterfly Valve	two	1,000
3" dia. Air Hose	2,400 lineal feet	15,000
Anchors	Lump Sum	1,000
Diffusers and piping	Lump Sum	8,000
Inlet and outlet FRP pipes	Lump Sum	8,000
Separator box	Lump Sum	80,000
Security fencing	Lump Sum	2,0000
Warning signs	Lump Sum	600
Subtotal		$259,700
Contingency (20%)		51,940
Subtotal		$311,640
Washington State Sales Tax		25,560
Total		**$337,200**



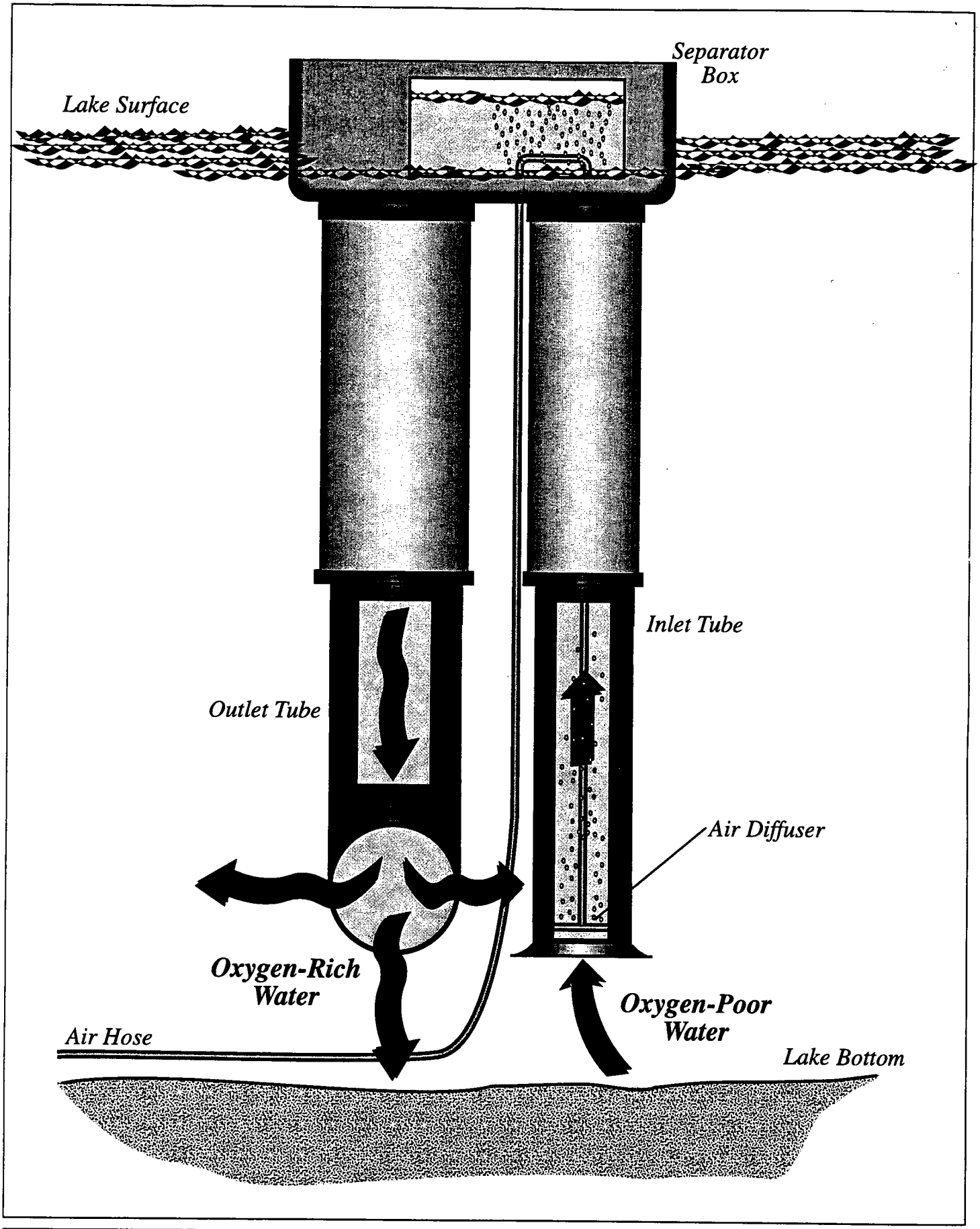
KCM *1917 First Avenue* *Seattle, Washington 98101*	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 1. BATHYMETRIC CONTOURS AND PROPOSED AERATOR LOCATIONS



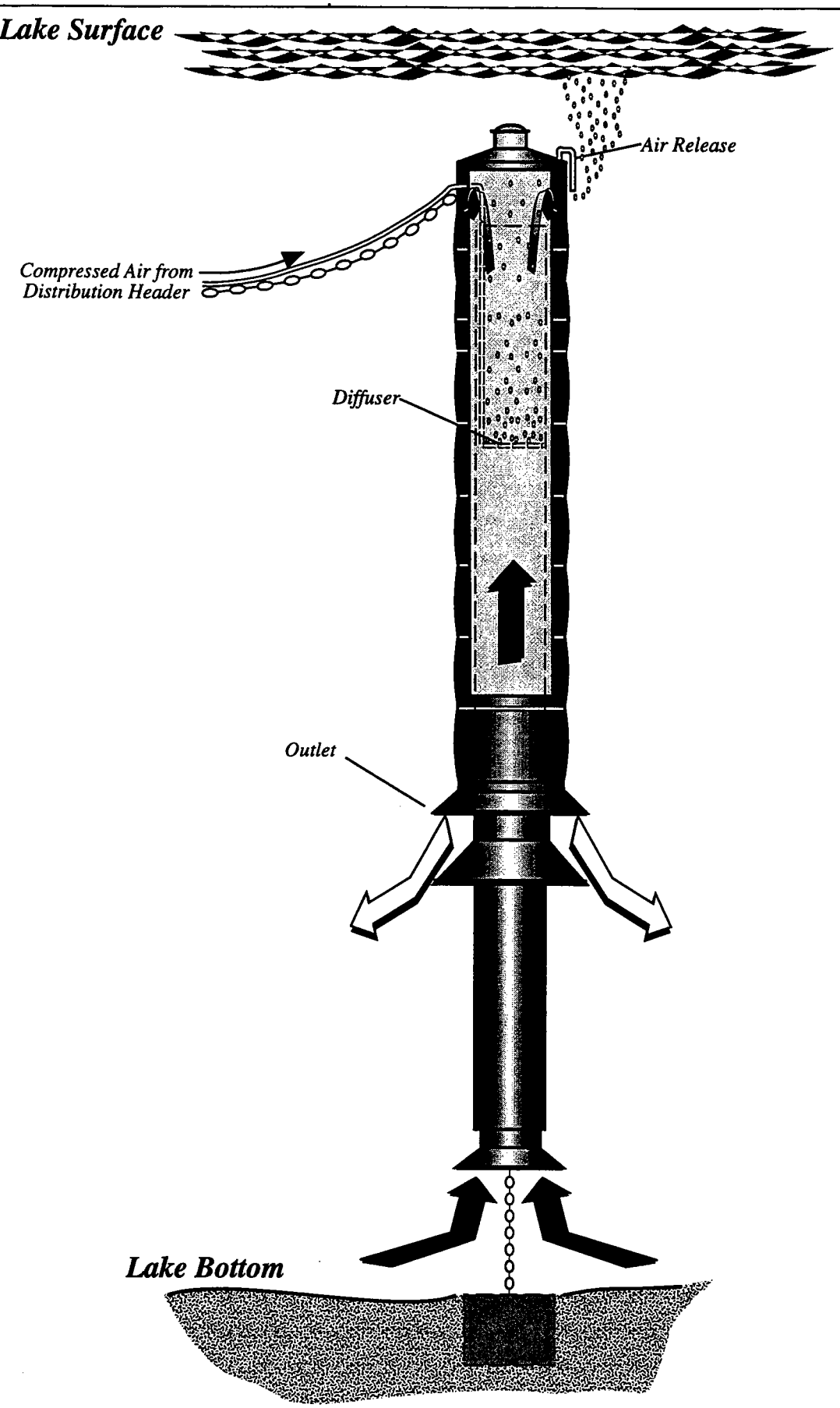
KCM *1917 First Avenue* *Seattle, Washington 98101*	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 2. TEMPERATURE PROFILES



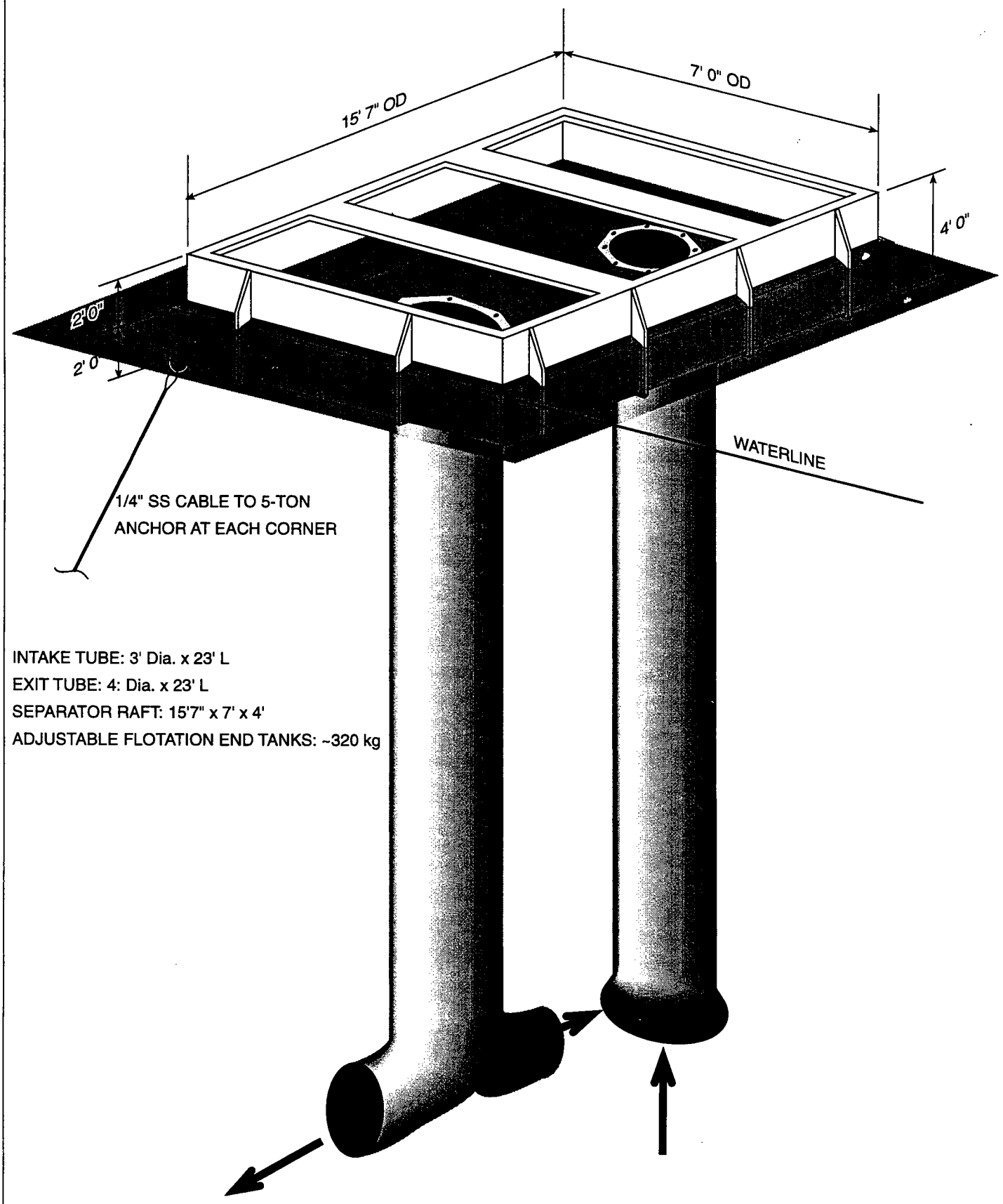
KCM *1917 First Avenue* *Seattle, Washington 98101*	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 3. DISSOLVED OXYGEN PROFILES



KCM 1917 First Avenue Seattle, Washington 98101	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 4. FULL-LIFT HYPOLIMNETIC AERATOR



KCM 1917 First Avenue Seattle, Washington 98101	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 5. PARTIAL-LIFT HYPOLIMNETIC AERATOR



KCM *1917 First Avenue* *Seattle, Washington 98101*	King County Surface Water Management LAKE DESIRE HYPOLIMNETIC AERATOR ENGINEERING ANALYSIS	Figure 6. PROPOSED LAKE DESIRE HYPOLIMNETIC AERATOR

G. Public Comment Letters and Responses

King County Department of Public Works

King County Surface Water Management
Everyone lives downstream

Public Meeting

The King County Surface Water Management Division (SWM) invites you to a Public Meeting on the draft Lake Desire Management Plan. Come share your comments regarding Lake Desire.

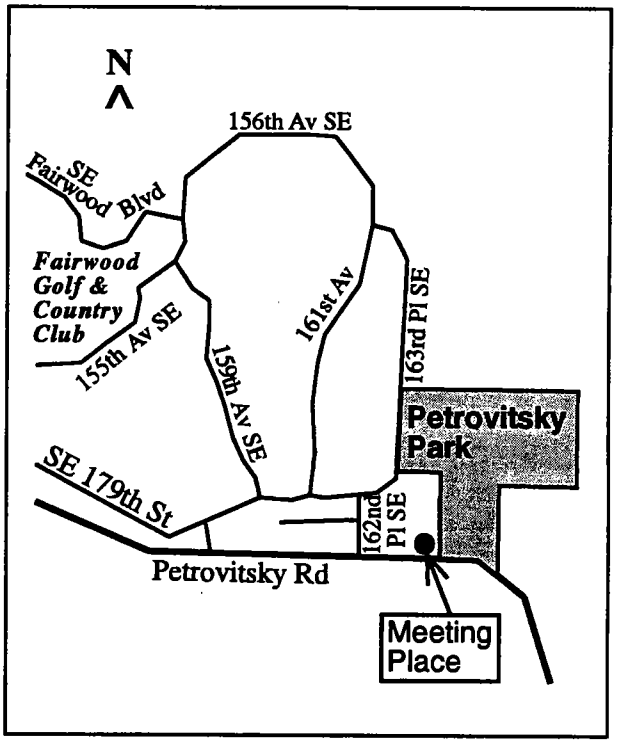
Date: Wednesday, February 15, 1995
7:00 PM - 9:00 PM

Location: Ridgewood Elementary School Library
18030 - 162nd Pl. SE
Renton

Purpose of the Project: The overall goal of the project is to develop a long-term lake and watershed management plan which will improve the water quality of Lake Desire. The project began in 1993 with a detailed one-year study of the physical, chemical, and biological components of the lake and watershed. With input from the community, eight lake and watershed management goals were set. The draft plan developed from these goals contains 14 recommendations which address watershed and in-lake water quality, aquatic plant control, monitoring, and contingency actions.

Status of the Project: King County SWM is seeking public comment on the draft Lake Desire Management Plan. Comments may be presented at the public meeting or submitted in writing to:

Sharon Walton, Project Manager
King County Dept. of Public Works
Surface Water Management Division
700 Fifth Avenue, Suite 2200
Seattle, WA 98104



The public meeting will be an opportunity to learn more about the plan and the proposed actions for restoring Lake Desire.

We hope you can join us.

For more information: Call Sharon Walton, Project Manager, at 296-8382. Copies of the plan are available through the Lake Desire Community Club and the King County Fairwood Branch Public Library.

Funded in part by a Washington State Department of Ecology Centennial Clean Water Fund grant.

Printed on recycled paper; please recycle.

Text will be made available in large print, Braille, or audio tape as requested.

King County
Department of Public Works

Surface Water Management Division
700 Fifth Avenue, Suite 2200
Seattle, WA 98104
(206) 296-6519

Lake Desire
Public Meeting

Wednesday, February 15th

Duplicate mailings? Change of address?

Call SWM at 296-6519 or send your label, with the correct address clearly marked, to:

King County Surface Water Management,
Attention: Front Desk/Reception
700 Fifth Avenue, Suite 2200
Seattle, WA 98104
Please allow 6 - 8 weeks for changes.

Flyer text can be made available in alternative formats. Sign language interpretation can be provided at events if requested in advance.
Call to arrange accommodations. Voice: Pat Johnson 296-8029
TDD: King County Information 296-0100

King County
Surface Water Management Division
Department of Public Works
700 Fifth Avenue Suite 2200
Seattle, WA 98104
(206) 296-6519
(206) 296-0192 FAX

AGENDA

Lake Desire Management Plan

Public Meeting

Ridgewood Elementary
Renton, WA

February 15, 1995
7:00-9:00 p.m.

1.	Introductions	5 minutes
2.	Meeting Overview	5 minutes
3.	Lake Desire Management Plan -Sharon Walton, King Co. Surface Water Mgt.	40 minutes
4.	In-lake Restoration Techniques -Debra Bouchard, KCM Inc. -Harry Gibbons, KCM Inc.	15 minutes
5.	Comments, Question, and Answers	35 minutes
6.	Preferred Management Plan Alternative Selection	5 minutes
7.	Meeting Closing	5 minutes

Funded in Part through a Washington State Department of Ecology Centennial Clean Water Fund Grant

King County
Surface Water Management Division
Department of Public Works
700 Fifth Avenue Suite 2200
Seattle, WA 98104
(206) 296-6519
(206) 296-0192 FAX

March 9, 1995

TO: Lake Desire Technical Advisory Committee Member

FR: Sharon Walton, Lake Desire Project Manager SPW

RE: Response to public comments on the Draft Lake Desire Management Plan

The lake management plan was presented to the public on February 15, 1995. Twenty members of the public were present and had general questions on the in-lake treatments, alum toxicity, the contribution of phosphorus from on-site septic systems, and funding of plan implementation. The public was asked to vote on their preferred restoration scenario. By a margin of 5:1, the public supported the combined in-lake treatments of alum and aeration verses aeration alone.

Written comments were due on the management plan this past March 3, 1995. Only a single comment letter was received on the plan. Enclosed you will find a copy of the comment letter as well as a response to the comment letter which will be enclosed in the final plan.

The degree to which on-site septic system contribute to the phosphorus loading to the lake has been repeatedly raised by the public as well as in the attached comment letter. To address this phosphorus loading issue, additional detail will be provided in the nutrient budget chapter regarding the project team's arrival at the final loading estimate from on-site septic systems which was used in the lake phosphorus model. The response to item 5 of the enclosed comment letter will give you an idea of the content of the text additions for the final plan.

If you have any questions regarding the comments received on the draft plan or how they will be incorporated into the final plan, please let me know by Thursday, March 16, 1995. My phone number is 296-8382.

Thanks again for all of your work on the project. You can expect to see your final copy of the plan in April.

cc: Bill Eckel, Manager, Water Quality Unit

Hedges
& Roth Engineering, Inc.

ENGINEERS
PLANNERS
SURVEYORS
AM/FM/GIS

March 3, 1995

King County Surface Water Management Division
Department of Public Works
700 Fifth Avenue, Suite 2200
Seattle, Washington 98104

Attn: Ms. Sharon Walton, Lake Desire Project Manager

Re: Review of Draft Management Plan

Dear Ms. Walton,

Thank you for the opportunity to provide input on the Draft Management Plan for Lake Desire. Attached is a brief report which provides background for our positions. All of our recommendations are based upon the preliminary and draft Plans, background and technical reports, which you supplied to us.

(1) *We are disappointed that there has been no analysis regarding the use of freshwater dilution of the lake as an alternative for in-lake treatment.

(2) *As with the preliminary draft Plan, this draft Plan together with the supporting background and technical reports provide much support for the connection of the area to sewers. Please see report no. 8 and our review of this draft, which is enclosed, and our response to the preliminary draft report.

(3) *The final report should include a cost benefit analysis which includes figures for all of the watershed recommendations. Four of the seven watershed recommendations costs have not been projected. These hidden costs should be shown. In order for the community to better analyze the data we recommend that the cost benefit analysis clarify which measures are long-term (such as sewering) or short-term (such as alum treatment).

(4) *The special requirement increasing wetponds beyond the Surface Water Design Manual by a factor of 4.5 is unnecessary. Please keep in mind the SWDM uses AKART (all known, available, and reasonable methods of prevention, control and treatment) with VB/VR = 1 not 4.5. It is our understanding that only six ponds have been built using the 1990 standard, and that none of them are experiencing problems nor are they expected to. We respectfully suggest that prior to your encouragement of these extreme measures that your Division wait until a peer review and analysis is completed.

(5) -In reviewing the external nutrient budget, **septic systems account for more than 83%** of the P6, Subsurface loading. Your reports have been very clear that for the **long-term** benefits it is the external loading which needs to be resolved. Septics account for over 83% of the external loading and up to 48% of the total load for Lake Desire.

14450 NE 29th Pl., Suite 101, Bellevue, Washington 98007
(206) 869-9448 800-835-0292 FAX (206) 869-1190

1011 E Main, Suite 101, Puyallup, Washington 98372
(206) 840-9847 800-540-9847 FAX (206) 840-6217

-Over 16% of the on-site septic systems in the area have failed at some time.

(5) -Based upon the technical reports it is very likely that a majority of the existing septic systems may be reaching the end of their effective lives.

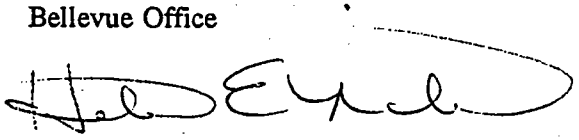
-Removing sewer effluent from flowing into the lake provides the greatest long-term benefit.

(6) *Although the area in question has a full service designation within the Urban Growth Area for King County, the vast majority of the lots have been previously built upon. A great amount a land is currently within King County's Park and or Open Space program. Further, it is our understanding that in addition to unrealistic land use scenarios, the model also assumes NO constraints are in place. To suggest that the requirements of the drainage manual or the Sensitive Areas Ordinance will not be followed further skews the results of the modeling. We feel that it is very misleading for the modeling to be based upon a land use scenario which we know WILL NOT occur. We suggest that the area be remodelled with realistic characteristics of the land and regulations upon the development of that land.

If there are questions regarding the above, please do not hesitate to contact me at 869-9448. We would like Surface Water Management and the Technical Advisory Committee to review and consider our recommendations for the final plan.

Very truly yours,

HEDGES & ROTH ENGINEERING, INC.
Bellevue Office



Helen E. Nilon

HEN:nh

attachments enclosed: Hedges & Roth review: Engineering Analysis

cc: Ron Speer, Operations Manager, Soos Creek Water & Sewer District
John Roth, Jr., District Engineer
Katherine Maxwell, MT, CR, Hedges & Roth Engineering
Lake Desire Management Plan Technical Advisory Committee

h:\home\nilonh\scwsd\preldmp.m03

Hedges & Roth Engineering, Inc.
14450 NE 29th Pl., Suite 101, Bellevue, Washington 98007
(206) 869-9448 800-835-0292 FAX (206) 869-1190
1011 E Main, Suite 101, Puyallup, Washington 98372
(206) 840-9847 800-540-9847 FAX (206) 840-6217

Lake Desire Management Plan

Comments on the
Draft, January 1995

Reviewed on behalf of Soos Creek Water and Sewer District.

Reviewed by: Mark A. Thompson, P.E.
Hedges & Roth Engineering, Inc.
14450 NE 29th PL Suite 101
Bellevue, WA 98007
(206) 869-9448

Objectives

The goals outlined by the Lake Desire Management Plan are proper and very acceptable. The plan's objective is to:

- Provide education and involvement opportunities for the public throughout the project to foster public ownership and commitment to the development and implementation of the lake management plan;
- Quantify and characterize the physical, chemical and biological components of the lake and its surrounding watershed;
- Develop a nutrient and water budget which can be used as an analytical tool for the evaluation of restoration alternatives and development of a lake management plan;
- Identify existing sources of point and non-point pollution to estimate their importance in determining the trophic condition of Lake Desire,; and
- Develop a comprehensive management plan for the improvement and protection of water quality in Lake Desire.

The study succeeded in these goals to a great degree. This review presents options to increase the measure of success of this study.

Septic Drain Field Loading

Lake Desire was found to be the third worst lake out of 16 lakes surveyed by Metro between 1972 and 1974. Only Cottage Lake and Lake Ballinger had poorer water quality. Although many factors enter into such a determination, phosphorus loading to the lake is a primary factor, contributing to low transparency and high algal biomass. (E.G. Welch, 1980, "The Ecological Effects of Wastewater") This generalization was specifically shown to be true in Lake Desire for most of the year, except November. (see Figure 4-6) The largest external contributor of phosphorus was found to be from subsurface flows into the lake. (Table 6-2)

Septic systems are the greatest producer of this phosphorus. The septic systems are contributing somewhere between 30 to 87 kg phosphorus (TP) annually to the lake. (page 6-6) The report is correct to provide both numbers showing the lower and upper end of an engineering estimate. The lower number assumes peak operating conditions, or 90 percent efficiency in removal. **Efficiency may not be this good because of the age of some of the septic systems and the poor soils in the drain fields. This is reflected in the higher number of 87kg phosphorus loading.**

Septic systems, then, are contributing 24 to 48 percent of the total phosphorus in Lake Desire. This includes the internal loading from the bottom of the lake which has built up over the years. (Table 6-2) After the proposed alum treatment, this bottom loading will be reduced by 90 percent. Then the septic systems will be providing between 35 and 61 percent of the loading; by far, the number one cause of pollution to Lake Desire.

This fact is unrefuted and the report admits that long-term benefits can only be realized by removing the external sources of pollution. However, the report references work done on the HSPF computer model showing little benefit from sewering. Unfortunately, we cannot say much in detail about this work, since the report does not state the parameters used in the model.

From an overall perspective, the results of the model are suspect. Logically, the effect of removing such a large fraction of nutrients should make a corresponding improvement in the quality of Lake Desire. If the HSPF computer model results do not show that improvement, then those results should be questioned.

Cost/Benefit Analysis

The cost for the Lake and Watershed Recommendations would be financed by property assessments to the 126 property owners of the proposed Lake Management District (LMD). The benefit to the LMD was estimated to be from 13 to 30 million dollars in estimated increases in shoreline property market value.

The cost of four out of seven watershed recommendations was not included in the final assessment figure. (Table 7-1) These implementation costs are to come from either mandatory development restrictions or additional assessments to the LMD. Development restrictions include open space retention and building set-backs and clearing limits for which the property owner is not compensated. Also, some wetland property owners will be approached for acquisition of open space in Recommendation LD-2. The cost of this recommendation is not included in the report and may be born by the LMD.

These hidden costs should be shown. From the standpoint of the property owner, they are very real, even though they are not up-front, construction costs. These assessment costs are required to be disclosed to potential buyers during the sale of property and combine to make it less valuable.

The report states "the cost of sewering versus the relative benefit produced in terms of improved lake water quality is small compared with the implementation of other watershed and in-lake measures." (pg. 7-9) The cost of four out of seven watershed recommendations was not included or implied to be zero. (Table 7-1) Without a complete cost estimate, there is no way to make this comparison. Such a comparison would be an important part of this report.

The report goes on to say "if sewering does occur, the short-term gains of phosphorus reduction may be offset by increased shoreline density and associated nonpoint pollutant loading." This is obviously a mistake. We raise two points about this. First, sanitary sewers and other watershed measures provide long-term benefits by removing the external sources of pollution. It is the in-lake measures that provide short-term gain. The second point is that if this report finds that limiting development is in the best interest of the lake, then zoning regulations, not sewer restrictions, are the best tool for doing this. Such intentions should be directed to the appropriate agency.

LD-4 Stormwater Treatment

Another development cost added by this plan is the increased requirement for stormwater treatment. It was interesting to note that this was recommended based on future modeled conditions even though current conditions show surface runoff to be the smallest source of lake nutrients, giving only 5 kg TP as compared to 30 - 87 kg for septic sewers. Implementation of this plan would increase the size of treatment ponds 4.5 times over the 1990 standard. One of the justifications made in adopting the 1990 standard was that it represented all known, available, and reasonable methods of prevention, control, and treatment (AKART). If it was reasonable at that time, how can increasing the standard by 4.5 be reasonable now? What is the rationale behind this number? We are concerned that there hasn't been enough time to evaluate the effectiveness of the current design standard, since very few systems have been built. It may be too soon to propose increasing it.

Treatment ponds are sized to contain the volume of rain from the mean annual 24 hour runoff. The given runoff coefficients of 0.9 and 0.25 seem to imply using the rational method. The currently accepted method is SBUH. Was it the intent of the report to change this?

Summary

Much media attention has been given lately to non-point source pollution and the public is being educated about this new danger. The message is that we are dealing with point sources of pollution that have a readily identifiable discharge points, but that there is another, newly identified enemy to our environment found in the runoff from our roads and lawns. This message has been so successfully administered to the point where we are now beginning to forget about point-source pollution, such as septic tank leachate.

This review has in mind the same goals as the Lake Desire Management Plan. Those goals include the identification of existing sources of pollution and utilizing all known and reasonable methods of prevention, control, and treatment. Sanitary sewer service would be an important part of the long-term solution for Lake Desire, as it has in other lakes around the country. It should be the first recommendation in this report.

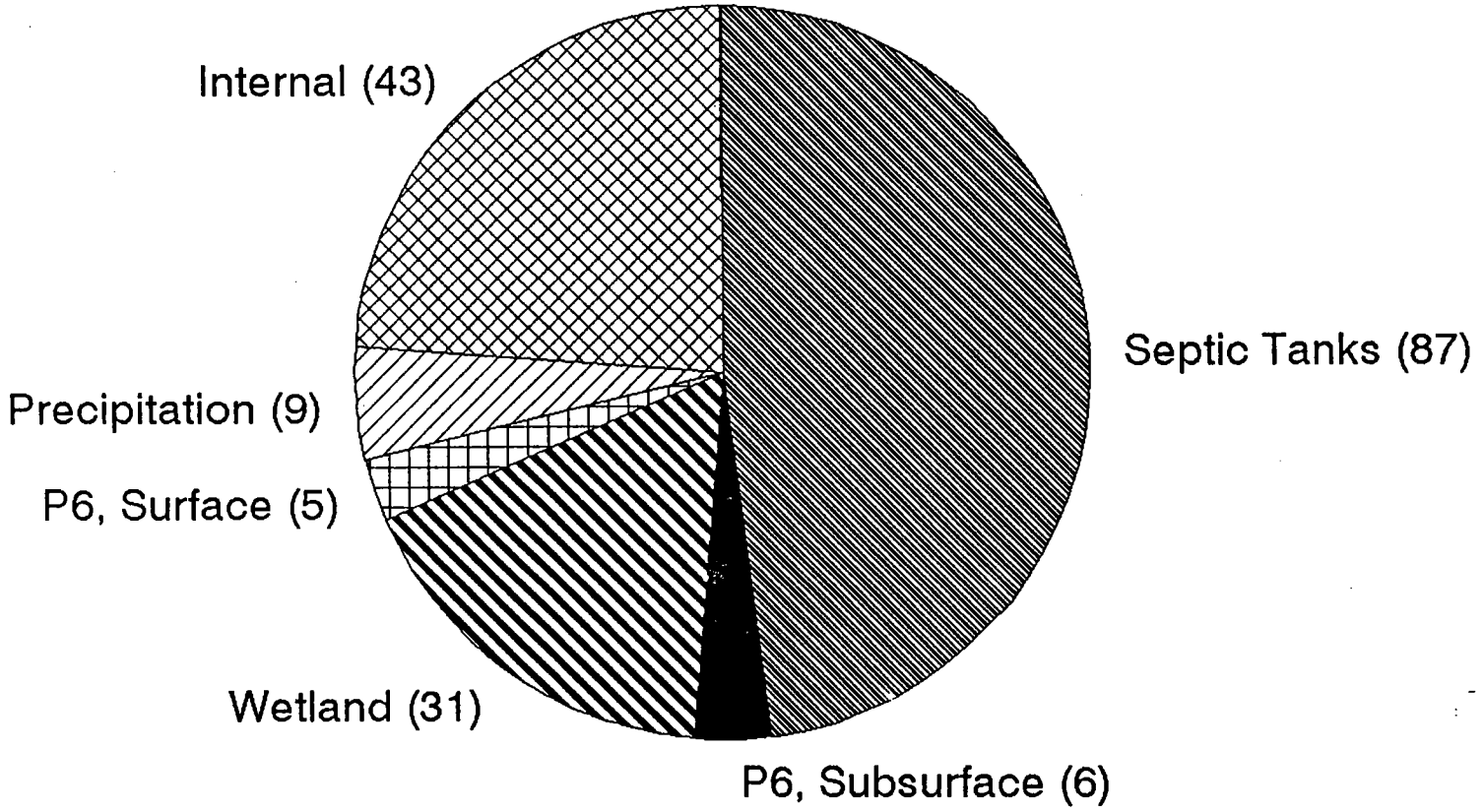
by: Mark A Thompson

Mark A. Thompson

Internal & External Phosphorus Loading

(Kg per year)

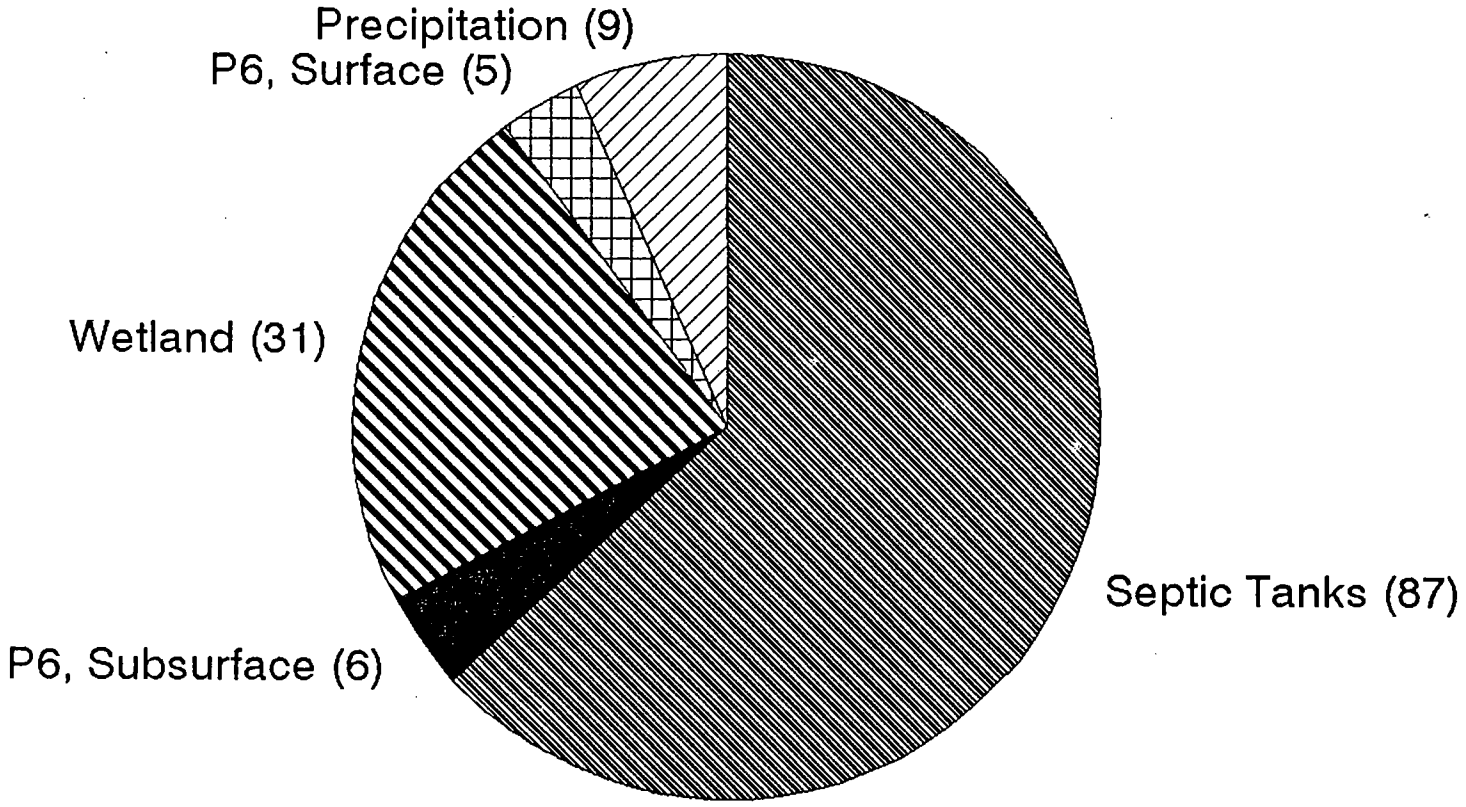
Table 6-2



External Phosphorus Loading

(Kg per year)

Table 6-2



DRAFT Response
Hedges and Roth Eng. Inc. Comments on Lake Desire
March 9, 1995

1. Dilution as an in-lake restoration alternative is usually feasible where large amounts of low-nutrient water is readily available. As stated in previous discussion with the Lake Desire Technical Advisory Committee and in both the preliminary draft and draft management, dilution was not considered a feasible alternative due to the lack of low-nutrient water supply. Water rights/permits for non-domestic uses are increasingly rare in the current climate of water conservation and the projected water supply needs predicted for the Puget Sound region.

In order for dilution to be successful, a flushing rate of 10 to 15 percent per day is typically needed annually (Cooke, Welch, Peterson, and Newroth, 1994). The lake volume for Lake Desire is 921 acre-feet which would suggest that 30 to 45 million gallons per day (mgd) would be needed to make dilution a feasible alternative. I spoke with Ron Spear, Operations Manager of the Soos Creek Water and Sewer District regarding the availability of water for dilution He confirmed that the water supply is not available from the District..

If the water was available, it would cost an estimated $48,000 per day including dechlorination of the water to provide 30 mgd to Lake Desire. To give you the order of magnitude of such a supply, the Soos Creek Water and Sewer District currently serves 50,000 customers at 3.5 mgd. The district would have to increase their current supply by a factor of eleven in order to meet the volume needed for effective dilution.

2. The management plan agrees that an incremental benefit to lake water quality is associated with sewers. Please see additional explanation under response 5.

3. The final report will not include costs associated with watershed recommendations which are not proposed to be funded through the implementation strategy detailed in Chapter 7 of the plan. The intent of structuring the management plan costs as shown in Chapter 7 is to distinguish the actions which are proposed to be implemented through private and/or grant funding. Recommendations LD-3, LD-6, LD-8, LD-9, LD-10, LD-11, LD-13, and LD-14, are proposed to be funded through a combination of lake management district (LMD) revenues, private sector funding, and grant. The cost benefit analysis was performed to show the benefits which could be directly attributed to the funding of these specific actions versus the cost of funding them through an instrument such as a LMD.

In the attached comments submitted by Mark Thompson, he states that the hidden costs should be shown. For recommendations LD-1 for forest retention, there is no additional cost to property owners associated. The costs associated with LD-2, wetland restoration, are anticipated to come from existing programs and do not represent a new cost to watershed property owners. Similarly, costs associated with recommendation LD-4, stormwater treatment, are not new costs because of the existing p-suffix conditions in the Lake Desire watershed which require additional stormwater quality treatment. The

recommendation is intended to clarify what is needed to meet the intent of the p-suffix condition.

Sewering costs were not included in the cost/benefit analysis because the project team determined that sewering was not an essential watershed measure for meeting the lake and watershed management goals (Table 6-5). The project team has determined that in-lake aeration combined with watershed best management practices and forest retention represent the most cost effective solution to improving in-lake water quality. If sewering costs where to be include (at an estimated cost of two million dollars), the costs would be much greater than the proposed benefits to lake water quality.

4. The King County Surface Water Design Manual is currently being updated for 1996 to be consistent with the requirements of the Washington State Department of Ecology's Stormwater Manual. If you are interested in participating in its review please contact Amanda Oliveira at 296-1912.

In your comments you stated that a VB/VR (volume of basin permanent pool to volume of runoff from the mean annual storm) 4.5 is unnecessary. Substantial research has gone into the 1996 Design Manual update including the new sizing recommendations for wetponds and the anticipated phosphorus removal expected with such designs. It is estimated that a VB/VR ratio of 3.0 provides a total suspended solids removal of 80 percent and a total phosphorus removal efficiency of 35 percent. In order to achieve a 50 percent removal efficiency for total phosphorus, a VB/VR of 4.5 is recommended. Removal of 50 percent of total phosphorus inputs to sensitive lakes is proposed in the design manual update and is supported by the State manual requirements for mitigation of water quality sensitive areas (minimum requirement #7)

The 1990 Surface Water Design Manual does not require all known, available, and reasonable methods of prevention, control, and treatment (AKART) for phosphorus control for the Lake Desire watershed and represents the base stormwater standards for King County. AKART standards are currently required by a variety of p-suffix in various sensitive watersheds such as Lake Desire. The Soos Creek Community Plan Update (1991) p-suffix condition for the Lake Desire Urban Phase 1 states:

> "Properties in the Lake Desire Drainage Basin shall meet all water quality and quantity requirements as outlined by the King County Surface Water Management Division. These requirements must be in compliance with the State Growth Management Act. Special attention should be given to increased retention/detention requirements and clearing restrictions on undeveloped parcels *and stormwater treatments which will ensure that the quality of discharge waters shall be equal to or better then current Lake Desire Water Quality* [emphasis added]."

Most facilities built using the 1990 design manual have been built for water quantity control. Those which have been built based on the 1990 design manual for water quality control certainly do not meet the definition of AKART due to their minimal effectiveness for phosphorus control. Thus, the existing requirements of the design manual do not begin to meet the intention of the p-suffix condition and so recommendation LD-4 was developed as part of the lake management plan to establish an appropriate treatment standard.

5. For the management plan, on-site septic systems at Lake Desire were evaluated based on variety of sources including: 1) groundwater monitoring data; 2) review of the Seattle-King County Department of Public Health records; 3) the use of Aerial Shoreline Analysis and field surveys; and 4) the preliminary nutrient budget.

Based on the existing nutrient budget (Table 6-2), septic systems account for as much as 30 kg per year of phosphorus or 24 percent of the total nutrient budget, 37 percent of the external loading, and 83 percent of the P6 subsurface loading. The reasoning behind using the 30 kg per year estimate verses the 87 kg per year estimate is as follows:

> From the Lake Desire On-site Septic System Assessment, it was calculated that between 30 and 87 kg per year of total phosphorus could be attributed to on-site septic systems. This estimate was based on the average amount of phosphorus discharged in household wastewater (based on literature values) and a series of assumptions regarding the efficiency of the 101 septic systems along the lake shoreline. If a 90 percent efficiency is assumed on average, the loading estimate is as low as 30 kg per year. If a series of less conservative efficiencies are assumed, the loading estimate is as high as 87 kg per year.
>
> In the groundwater analysis, it was estimated that approximately 15 percent of the total phosphorus entering the lake and 25 percent of the flow was from subsurface flow. This estimate was based on quarterly measured flow and water quality data and the hydrostratigraphy of the area.
>
> The lake model based on the Vollenweider (1975) non-steady-state model (which predicts whole-lake total phosphorus concentrations), integrates the information from the individual hydraulic phosphorus loading components (subsurface flows, surface, and precipitation sources) and internal phosphorus loading. This lake model is the standard in the field of limnology. Hydrologic Simulation Program-Fortran (HSPF) modeling was used only to generate existing, current, and future flows for developing the lake water budget.
>
> The lake model is based on a mass-balance of total phosphorus using the measured data from the study year, literature values, and professional estimates where data gaps exist or are difficult to accurately measure. As with most

modeling applications, certain components are more easily measured and assessed. In lakes, inflow, internal loading, precipitation, and surface runoff are the easiest to measure and predict, while groundwater and subsurface flows remain more difficult.

As a check on the assumptions used to in the modeling analysis, the nutrient budget must balance on an annual cycle and modeled values should closely match measured values for existing conditions. Figure 6-3 represents the modeled versus the measured values for whole-lake volume weighted total phosphorus concentrations. From month to month, there generally is a good correlation between measured and modeled concentrations.

This model calibration suggests that the assumptions upon which the model is based regarding its individual components (subsurface, internal, surface, and precipitation) are providing a good estimate of the interrelationship between the components. The lack of specific evidence regarding ongoing failure of on-site septic systems confirmed the project team's choice to use the lower end of the loading range or 30 kg per year for on-site septic systems in the model. If additional information had come to light from the on-site septic system survey work or groundwater analysis or in the model calibration which suggested a higher contribution was appropriate (greater than 30 kg per year), the nutrient budget and the corresponding lake model would have been adjusted to better represent the available information.

The 16 percent on site septic system "failure rate" discussed in the plan (pg. 4-38) correctly represents a "repair rate" recorded by the Seattle-King County Department of Public Health. For the final plan, the nomenclature will be corrected. The repair rate may include such activities as upgrading of the septic system based on the addition of rooms to a home or physical repair of the system due to failure. The rate does not provide any quantitative information regarding total phosphorus loading from on-site septic systems.

The age of septic systems was identified as a concern of the management plan. With the designation of the area immediately around the lake as a full services area with the Urban Growth Area , sewers are already proposed for portions of the lake. In all likelihood most of the shoreline will probably become sewered in the future, making the age of the on-site systems a moot point.

A loading reduction benefit to the lake would be realized if sewer effluent was removed. However, the project team still supports the conclusion based on the modeling analysis that only a small incremental benefit would be realized through sewering and that subsequent improvement to water quality will only occur with in-lake treatment. Long-term maintenance of improved water quality from in-lake measures, however, will only be realized through the successful implementation of

watershed measures in combination with ongoing operation and maintenance of the in-lake aeration system.

6. The future land use, modeled for the management plan, takes into account the best available information regarding future land use in the lake watershed. The future land use model scenario did model the existing open and park spaces as it currently exists. Figure 2-7 which shows the future land cover which was used in the model and reflects the open and park spaces as forested land cover.

Although the unmitigated future land use scenario assumes no watershed mitigation measures, scenarios 7 and 8 in Table 6-5 represent two mitigated future conditions based on a best professional assessment of the future conditions/regulations present in the watershed including forest retention in the P7 catchment, stormwater regulations, and sewering (scenario 7 only). Additional text can be added to the modeling discussion to reflect that modeling of a realistic scenario has been performed as part of the modeling analysis.

King County
Surface Water Management Division
Department of Public Works
700 Fifth Avenue Suite 2200
Seattle, WA 98104
(206) 296-6519
(206) 296-0192 FAX

April 11, 1995

Leslie J. Groce
Environmental Planner
Fisheries Department
Muckleshoot Indian Tribe
39015 - 172nd Avenue Southeast
Auburn, WA 98092

Dear Ms. Groce:

Thank you for your comment letter dated March 23, 1995, regarding your review of the *Lake Desire Management Plan* and Environmental Checklist. As stated in our phone conversation of April 11, 1995, I would like to apologize for my oversight in not directly involving the Muckleshoot Indian Tribe in the development of the *Lake Desire Management Plan.*

At the time of the development of the plan's technical advisory committee, the salmonid resource value of Lake Desire was considered low. Also, I was aware of the larger ongoing Surface Water Management Division's planning effort in the Cedar River basin (the *Cedar River Basin and Nonpoint Action Plan*) which includes the participation of Tribal fishery staff in the analysis of salmonid habitat in the Lake Desire Watershed and Peterson Creek subcatchment. In the future, as implementation of the *Lake Desire Management Plan* proceeds, the participation of the Muckleshoot Indian Tribe will be directly requested.

Per our phone conversation, you confirmed the receipt of the additional technical materials provided by my co-worker, Fran Solomon, during my absence. In our conversation, you also agreed that any impacts to salmonids or any additional information needed to assess potential impacts related to the proposed in-lake restoration actions of the plan could be addressed under separate SEPA compliance associated with those specific activities. Your concerns regarding impact to salmonids have been noted and will be addressed at the point prior to the implementation of in-lake restoration actions.

To provide clarification of what is know about salmonid usage (specifically coho) in Lake Desire, the limited information on coho salmonid usage originates from the work of Bob Pfeifer, Fisheries Biologist, Washington Department of Fish and Wildlife. The historical records of WDFW show spotty usage by salmonids coho juveniles in the lake. No salmonid usage was observed during the November 1993 and May 1994 fisheries assessment (conducted by the project's consultant, KCM Inc. [Wayne Daley, KCM Fisheries Biologist]) using electrofishing and fyke net traps.

Response to your specific comments on the plan are as follows:

Management Plan

p. 2-7 and p. 4-30: Salmon will be added to the checklist. Prior to implementation of any proposed in-lake restoration action, any potential salmonid impacts will be addressed.

p. 4-38: This point has been noted already, the text has been revised to reflect that 15.8 percent represents a repair/maintenance rate rather than purely a failure rate.

p.6-17: The reference has been provided. Additional concerns will be addressed at the time of implementation of in-lake actions.

p. 6-19: The three watershed measures examined included sewers, forest retention, and watershed best management practices. The text on page 6-19 will be clarified.

p. 6-20, Table 6-5: Both 7A and 8A represent existing watershed land use conditions while 7B and 8B where modeled based on future land use conditions. This was used to evaluate the significance of watershed measures alone, with and without sewers.

p. 6-22: Table 6-3 list the future loading values for the watershed. For the Peterson-7 subcatchment 58 kg total phosphorus are predicted based on future conditions. The predicted percent decrease in total phosphorus loading would be 51 percent for forest retention.

p. 7-1, LD-1: On page 7-3 and 7-4 the recommendation LD-1 is discussed including the voluntary retention of forest in the Peterson-6 subcatchment. More detailed land use recommendations for the Peterson Creek drainage area were provided in the *Cedar River Draft Basin and Nonpoint Action Plan.*

p. 7-9, LD-7 Sewering: The benefits of sewering remain low due to the timing and overriding effect of internal loading on summer total phosphorus concentration in the lake under existing and unmitigated future conditions. The loading from subsurface flows (partially from septics) occurs year-round while internal loading predominately occurs during May-August and thus, has a much larger impact on summer lake water quality.

p. 7-9, LD-8 Alum Treatment: Recommendation LD-13, page 7-11, and Table 7-2 detail the proposed monitoring program including the analysis of impacts to the lake fisheries. Benthic invertebrate sampling will be added to Table 7-2 for the final plan.

p. 7-11, LD-13 Monitoring: The Tribal Fisheries Department will be invited to participate in the final development of the monitoring program and its implementation prior to plan implementation.

Environmental Checklist

p. 10, 5a.
The underlining of salmon on the checklist was an omission which will be corrected. An addendum to the checklist will be issued which notes the historical use of coho salmonids in the lake.

Supplemental Sheet for nonproject actions.
The *Lake Desire Management Plan* itself is considered a non-project action. Therefore the supplemental sheet was completed.

Thanks again for you comments on the *Lake Desire Management Plan.* I look forward to working with you more closely in the implementation of the plan and in the restoration of Lake Desire water quality. A final copy of the plan will be forwarded to you in early May. Please call me if you have any additional questions, comments, or concerns at 296-8382.

Sincerely,

Sharon P. Walton
Senior Limnologist

SW:gmc7

cc: Bill Eckel, Manager, Water Quality Unit
Lake Desire Technical Advisory Committee
Keith Hinman, Manager, Basin Planning Unit
ATTN: Roz Glasser, Manager, Cedar River Basin and Nonpoint Pollution Action Plan
Gino Lucchetti, Senior Ecologist

MUCKLESHOOT INDIAN TRIBE
FISHERIES DEPARTMENT

March 23, 1995

Sharon Walton
Senior Limnologist
Lake Desire Project Manager
King County Surface Water Management Division
700 Fifth Avenue, Suite 2200
Seattle, Washington 98104

RE: Draft Lake Desire Management Plan Review

Dear Ms. Walton:

First, thank you for the extension for review of the Lake Desire Management Plan to March 24, 1995. This extension was necessary because neither Rod Malcom nor I received a copy of this Plan for review until March 17, 1995. The Usual and Accustomed fishing area (U&A) of the Muckleshoot Indian Tribe encompasses King County and portions of Snohomish and Pierce Counties. Within this area, the Tribe has co-management responsibility (with WDFW) for the salmonid fisheries resource, including the resource present in the Cedar River watershed, which drains Peterson Creek and Lake Desire. For this reason, it is unfortunate that the Fisheries Department of the Muckleshoot Tribe was not aware of, nor asked to participate in the Technical Advisory Committee that assisted in the development of the Lake Desire Management Plan.

As I explained to Fran Solomon, there are many questions regarding information presented in the Plan. Most could probably be clarified if you could provide a copy of the *Lake Desire Background and Technical Reports* (King County, 1994a), referenced throughout this document. Of particular interest are the fisheries surveys conducted in November 1993 and May 1994, groundwater monitoring methodology, and wetland monitoring methodology.

Though the presence of salmonids (specifically coho) in Lake Desire is referenced throughout the document, no concrete information regarding numbers, age class or times of use are presented. This information is critical, especially in light of the Plan's recommendation to treat the lake with alum. Does this information exist and/or are there plans to develop more information regarding salmonid use in the lake prior to alum treatment? This is of particular concern since salmon use is not indicated in the Environmental Checklist for this project (see below).

Muckleshoot Tribe fisheries staff would like the opportunity to review *Cooke et al 1993b*, which documents the impact of alum treatment of lakes on fish. Of particular concern is the impact of the flocculant in the water column on the gills of fish residing in the lake. Have other lakes that contain salmonids been treated with alum; what were the short- and long-term impacts of the treatment on the salmonid population? How does aeration affect the flocculant? Finally, since the flocculant settles to and seals the lake bottom, it seems unlikely that alum treatment has little impact to the macroinvertebrate population in the lake.

The cost of aerators for Lake Fenwick and Lake Stevens is referenced on p.6-18. Are there data available that show the improvements in these lakes as a result of aeration? Are the systems used in these lakes

39015 172nd Avenue S.E. • Auburn, Washington 98092 • (206) 931-0652 • FAX (206) 931-0752

similar to the hypolimnetic aeration system proposed for Lake Desire? Lake Newman is also referenced; what is the fisheries population in this lake and how successful are the hypolimnetic aeration systems?

Attachment I also details concerns regarding the Environmental Checklist for this project. Of particular concern is that salmon were NOT identified in Section 5a, p.10 of the Environmental Checklist, despite the fact that their presence in Lake Desire is referenced throughout the Management Plan. Is the information regarding vactor waste pertinent to the Lake Desire project?

Understanding that separate SEPA compliance will be conducted for in-lake measures, fisheries staff at the Muckleshoot Indian Tribe look forward to enhanced communication as part of a cooperative effort towards ensuring our common goals in the successful implementation of the Lake Desire Management Plan. If you have any questions or concerns regarding these comments, please feel free to contact me at 939-3319 ext. 128.

Sincerely,

Leslie J. Groce

Leslie J. Groce

cc: RM, MIT
Bill Eckel, SWM

Attachment I
Draft Lake Desire Management Plan Review
Muckleshoot Indian Tribe Fisheries Department Suggested Modifications

p. 2-7
"Chinook and sockeye salmon utilize the main stem of Peterson Creek while coho salmon are known to migrate up Tributary 0328B to Lake Desire."

AND p.4-30
"Lake Desire is known to have a high quality fish population. The Washington State Department of Fish and Wildlife rates the lake as a moderately important fishery.... Of particular importance is the presence of coho salmon juveniles in the lake...." (King County, 1993b)

Please refer to cover letter for concerns.

p.4-38
Septic survey -"There are 101 on-site septic systems ....15.8 percent have reportedly failed at some time ..." (King County, 1993b)

How was this percentage determined? In past studies, pumping of a septic tank has been improperly considered a failure.

p.6-17
"The use of alum salts may cause toxic conditions, although alum treatments have not resulted in adverse impacts on fish to date (Cooke et al. 1993b) and have not damaged invertebrate populations in well-buffered lakes ..."

Please provide this reference, if possible. Refer to cover letter for additional concerns.

p.6-19
Modeling scenarios list - Watershed Package (all three measures) = ?

p.6-20, Table 6-5
It is difficult to understand why there is a difference in TP between 7A and B and 8A and B.

p.6-22, and elsewhere
"reduce the future phosphorus load from that subcatchment by 30 kg TP per year."

To put this number in perspective, include a % decrease (I wasn't sure which number I should divide by to determine this value).

p.7-4, LD-1
Minimum forest retention should be recommended for the Peterson-6 subcatchment area so that at the very least this information could be incorporated as part of SEPA mitigation as the area is built out. This was also recommended as part of the P-suffix conditions in the Soos Creek Community Plan Update (p.7-6).

Clustering homes as far away as possible from the lake should also be considered, similar to the townhouse zoning proposed in the Soos Creek Community Plan for Big Soos and Soosette Creeks.

p.7-9, LD-7 Sewering
Is the reason sewering does not significantly improve TP levels because the housing density remains low when sewers are not available? If that's the case, the wording is fine. If not, this document should be

consistent with the recommendations of the Soos Creek Community Plan and Growth Management that require sewering in areas with urban designations.
Reference, p.2-9
"Under this new zoning, sewer and water service must be present to realize the density associated with the designation of RS-7200-P..... new development lot size will be restricted to 12,500 sq ft. .... for on-site septic systems."

p.7-9, LD-8 Alum Treatment
A pre- and post-treatment monitoring program should be recommended, including a thorough evaluation of the existing salmonid fisheries resource, and short- and long-term impacts of the treatment on this resource. Impacts on benthic organisms should also be evaluated.

p.7-9, LD-9 Aeration
Please refer to cover letter for concerns.

p.7-11, LD-13 Monitoring
At a minimum, staff of the Tribal Fisheries Department should be informed of the results of the fisheries studies. Even better, Tribal staff would like to participate in the development and implementation of the monitoring program for Lake Desire.

King County Environmental Checklist

p.10, 5a.
Salmon are not underlined, indicating they are not present on the site. This is contradictory to the text of the Lake Desire Management Plan, and contrary to WDFW information.

Supplemental Sheet for nonproject actions
Is this pertinent to the Lake Desire project?