

Draft

**CONTRACT DOCUMENTS, GENERAL
CONDITIONS, AND SPECIAL PROVISION
SPECIFICATIONS**

**BLACK LAKE
ALUM TREATMENT PROJECT**

Contract No. 2016-01

BLACK LAKE SPECIAL DISTRICT

February 23, 2016

Prepared by:

**Herrera Environmental Consultants Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121**

BLACK LAKE ALUM TREATMENT PROJECT

Contract No. 2016-01

SPECIAL PROVISIONS
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Appendices:

Appendix A – Treatment Plan

Appendix B – Black Lake Treatment and Signage Locations Map

Appendix C – Staging Area and Access Route

Appendix D – Chemical Distribution System Schematic

Appendix E – Permits

Appendix F – Shoreline Posting Template

Bonds and Insurance Required:

- A. Bid Deposit (Bid Bond)
- B. Payment Bond
- C. Contract Bond
- D. Standard Liability Insurance (as described in WSDOT Standards 1-07.18)
- E. Environmental Pollution Liability Insurance (as described above in 1-07.18 Public Liability and Property Damage Insurance)

SPECIAL PROVISION SPECIFICATIONS
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DESCRIPTION OF WORK

Black Lake is located in Thurston County, Washington, directly west of Tumwater and 4 miles southwest of Olympia. Black Lake is 2.4 miles long, and has a surface area of 570 acres and a volume of 11,000 acre-feet. One of the largest lakes in Thurston County (Thurston County 2012), Black lake has a maximum depth of 29 feet and a mean depth of 19 feet. The bathymetry of the lake is shown on the Black Lake Treatment and Signage Locations Map in Appendix B of this document. The lake has approximately 6 miles of shoreline and is located at an altitude of approximately 130 feet mean sea level.

Black Lake has high nutrient levels that result in cyanobacteria (blue-green algae) blooms. These blooms have occurred in most years since routine lake monitoring began in 1992. Water quality data collected by Thurston County since 1992 shows that Black Lake is eutrophic (high nutrients and algae) due to high phosphorus concentrations. Lake sediments are a primary source of the phosphorus during summer when it is released from iron as anoxic (no oxygen) conditions develop in the bottom waters. The excess phosphorus fuels excess cyanobacteria that float to the surface to form scums and often produce various cyanotoxins (chemicals which are toxic humans, mammals, and waterfowl).

In 2015, the Black Lake Special District and Herrera Environmental Consultants, Inc. completed the Black Lake Phosphorus and Algae Control Plan to identify the measures needed to reduce phosphorus inputs to Black Lake, and control the production of cyanobacteria and toxic algal blooms. The Phosphorus and Algae Control Plan recommends implementation of a whole-lake inactivation of phosphorus in deep sediments (below 15 foot depth) and phosphorus present in the water column alum treatment to control internal phosphorus loading. In 2016, the Black Lake Special District and Herrera Environmental Consultants, Inc. completed the Black Lake Alum Treatment Plan (Appendix A) to revise the alum dose and design the alum treatment.

The work detailed in this contract includes significant in-water work and chemical application. The Contractor shall strictly conform to all the requirements on the plans, specifications, applicable permits, and any other work deemed necessary by the Engineer for all in-water work and chemical application to protect Black Lake.

The Black Lake Alum Treatment Project includes the application of liquid aluminum sulfate (alum) and liquid sodium aluminate (buffer) simultaneously for phosphorus control in Black Lake. Chemicals will be applied to the treatment area consisting of the entire lake below the 5-foot depth contour with exclusion of within 5 meters (16) feet of docks or other structures, and the area within 25 meters (82 feet) of the lake outlet on the north shore. Chemicals will be applied at a ratio of 2 parts aluminum sulfate to 1 part sodium aluminate by volume unless otherwise directed by the Engineer based on jar tests con-

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ducted immediately prior to the application. Chemicals will be applied evenly over the entire treatment area at a rate equivalent to 12.9 grams of aluminum per square meter (g Al/m²). Chemical application will cease as directed by the Engineer based on pH testing or other factors such as an observed fish kill, as required by the permit or directed by Ecology. The project requires equipment, labor, and materials necessary to perform the work, including application equipment, and all other equipment necessary to mobilize and demobilize.

INSTRUCTION TO BIDDERS

BIDDER'S RESPONSIBILITY STATEMENT

It is the responsibility of each bidder to ascertain if all the documents listed on the index are included in their copy of the bid specifications.

If documents are missing, it is the sole responsibility of the bidder to contact the Black Lake Special District to obtain the missing documents prior to bid opening time.

1. LOW RESPONSIBLE BIDDER:

- A. It is the intent of Owner to award a contract to the lowest responsive and responsible bidder. Before award, the bidder must meet the following bidder responsibility criteria to be considered a responsible bidder. The bidder may be required by the Owner to submit documentation demonstrating compliance with the criteria. The bidder must:
1. Provide a current certificate of registration in compliance with chapter 18.27 RCW, which must be in effect at the time of bid submittal;
 2. Provide a current Washington Unified Business Identifier (UBI) number;
 3. Provide proof of Industrial Insurance (worker's compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW or provide a signed certification that such insurance is not required;
 4. Provide a current Washington Employment Security Department number, as required in Title 50 RCW or provide a signed certification that such number is not required;
 5. Provide a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW or provide a signed certification that such number is not required; and
 6. Disclose all cited environmental permit violations against the contractor and sub-contractors within the last five (5) years, including reference numbers and contact information for the agency/municipality issuing the citation. (i.e. construction stormwater quality, water quality certifications, hydraulic permit, wetland permit enforcement actions including: "Notice of Violation," Notice on Non-Compliance," "Administrative Orders to correct a Violation," civil penalties, and criminal convictions);
 7. The Bonding Company the contractor uses will be important to the Black Lake Special District. This Bonding Company must be: 1) registered with the Washington State Insurance Commissioner; and 2) appear on the current Authorized Insurance List in the State of Washington as published by the Office of the Insurance Commissioner.

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Name of Bonding Company	
Contractor's Bonding Limits	
Contractor's Bonding Capacity available for this job	

2. SUBCONTRACTOR RESPONSIBILITY:

- A. At the time of the execution of any subcontract, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria by requiring each subcontractor to:
 - 1. Provide a current certificate of registration in compliance with chapter 18.27 RCW, which must be in effect at the time of bid submittal;
 - 2. Provide a current Washington Unified Business Identifier (UBI) number;
 - 3. Provide proof of Industrial Insurance (worker's compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW or provide a signed certification that such insurance is not required;
 - 4. Provide a current Washington Employment Security Department number, as required in Title 50 RCW or provide a signed certification that such number is not required;
 - 5. Provide a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW or provide a signed certification that such number is not required; and
 - 6. Disclose all cited environmental permit violations against the contractor and subcontractors within the last five (5) years, including reference numbers and contact information for the agency/municipality issuing the citation. (i.e. construction stormwater quality, water quality certifications, hydraulic permit, wetland permit enforcement actions including: "Notice of Violation," "Notice of Non-Compliance," "Administrative Orders to Correct a Violation," civil penalties, and criminal convictions).

- B. The Contractor shall include the language of this section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. The requirements of this section apply to all subcontractors regardless of tier.

3. WORK HOURS AND SPECIAL TIME LIMITATIONS

Working hours shall be from 7:00 a.m. to 7:00 p.m., weekdays, and in accordance with the Thurston County Noise Ordinance.

4. COMPLETION TIME

The Contractor shall complete all work on Black Lake before **April 28, 2016**. All equipment and materials shall be de-mobilized and cleared from the site before **April 29, 2016**.

5. PRE-BID CONTACT

For information during the bidding period, please contact the Project Representative:

Lake Stintzi
Black Lake Special District
120 State Avenue NE, #303
Olympia, Washington 98501
(360) 867-8814
info@blacklakespecialdistrict.org

6. INSURANCE REQUIREMENTS

The Contractor shall procure and maintain, for the duration of this Agreement, insurance coverage in accordance with the requirements set forth herein.

All insurance costs shall be paid for by the Contractor. Such costs shall be deemed incidental to and included in the various bid items of work and no additional compensation will be allowed.

7. PERMITS

See Appendix E for specific permit conditions that apply to this project.

7. AWARD

The Black Lake Special District (owner) will award the Contract to the lowest responsive and responsible bidder based on the lowest Total Bid Price. The Black Lake Special District reserves the right to not award to the lowest responsive and responsible bidder at its sole determination for any reason.

8. SUPPLEMENTAL RESPONSIBLE BIDDER CRITERIA

To be considered a responsible bidder the Contractor shall submit written documentation demonstrating experience and competence in completing at least two (2) projects within the last five (5) years that meet the following additional requirements:

- Conducting buffered, whole-lake alum treatments in lakes that are 100 surface acres or more in size
- Application of alum as the nutrient inactivation and sodium aluminate as the buffering agent
- Experience in the proper handling and application methods for aluminum

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sulfate and sodium aluminate in a simultaneous treatment at a specific volumetric rate

- Operating equipment within identified ordinary high water lines of a lake
- Successful compliance with the requirements of the Aquatic Plant and Algae Management General Permit written by the Washington Department of Ecology.

For each of the qualifying projects, identify the following:

- name of the project and how it meets each of the additional requirements identified above,
- the Aquatic Plant and Algae Management General Permit number,
- initial contract time (start and end dates), and final contract time (actual end dates),
- the initial contract value,
- the final contract value,
- name of the contractor's project manager on the qualifying project
- name and telephone number of project owner, and
- name and telephone number of the owner's project manager or other person who can verify the Contractor's experience.

10. BID SUBMISSION

Forms I through V, provided herein, must be executed by **ALL BIDDERS** prior to submittal of the bid and, except where otherwise provided herein, must be submitted with the bid.

I NONCOLLUSION CERTIFICATE

To be completed, signed and notarized.

II BIDDER'S QUALIFICATION CERTIFICATE

To be completed and signed. The Black Lake Special District reserves the right to check all statements and to judge the adequacy of the bidder's qualifications.

III SUBCONTRACTORS LIST

To be completed by all bidders within one hour of the bid opening. This form is required on all projects with construction costs of one million dollars or more.

IV BID PROPOSAL DEPOSIT FORM

Provide either a Deposit or Bond. The BID BOND must be executed by the bidder and the surety company. The amount of BID PROPOSAL DEPOSIT shall not be less than 10% of the Total Bid Price and may be shown in dollars or on a percentage basis.

V PROPOSAL/CONSTRUCTION CONTRACT AND BID FORM

The unit prices must be shown in the spaces provided. The Proposal must be signed. Unit prices for all items, all extensions and the total amount of the bid must be shown. Show unit prices in both figures and words. Where a conflict occurs, the

written or typed words shall prevail. All entries must be typed or entered in ink.
BIDDERS MUST BID ON ALL ITEMS CONTAINED IN THE PROPOSAL. The omission or deletion of any bid item will be considered non-responsive and shall be cause for rejection of the bid.

Forms VI and VII, provided herein, to be completed by the **SUCCESSFUL** bidder.

VI PERFORMANCE AND PAYMENT BOND

To be executed by the successful bidder and their surety.

VII AGREEMENT

To be signed by the successful bidder.

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FORMS AND CERTIFICATES

- I NONCOLLUSION CERTIFICATE
- II BIDDER'S QUALIFICATION CERTIFICATE
- III SUBCONTRACTORS LIST
- IV BID PROPOSAL DEPOSIT FORM
- V PROPOSAL/CONSTRUCTION CONTRACT AND BID FORM
- VI PERFORMANCE AND PAYMENT BOND
- VII AGREEMENT

I NONCOLLUSION CERTIFICATE

STATE
OF _____

COUNTY OF _____

The undersigned, being duly sworn, deposes and says that the person, firm, association, co-partnership or corporation herein named, has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in the preparation and submission of a proposal to the Black Lake Special District for consideration in the award of a contract on the improvement described as follows:

Project Title: The Black Lake Alum Treatment Project
Contract Number: 2016-01



(Name of Firm)

CORPORATE SEAL:

By: _____
(Authorized Signature)

Title: _____

Sworn to before me this _____ day of _____, _____.

Notary Public

End of Noncollusion Certificate

II BIDDER'S QUALIFICATION CERTIFICATE

The undersigned hereby certifies and submits the following qualifications:

I. Name and Address _____

2. Washington Registration No. _____ Expires: ____/____/____(M/D/Y)

3. Number of years in contracting business under present name: _____ years

4. Particular types of construction work performed by your company:

5. List several recent construction projects performed that meet the **SUPPLEMENTAL RESPONSIBLE BIDDER CRITERIA** as specified in this contract:

Amount	Type	Owner	Contact	Phone
a.	_____	_____	_____	_____
b.	_____	_____	_____	_____
c.	_____	_____	_____	_____
d.	_____	_____	_____	_____
e.	_____	_____	_____	_____

6. Gross amount of contracts now in hand \$ _____

7. Bank Reference(s):

Name	Address	Account No.	Type
a.	_____	_____	_____
b.	_____	_____	_____

By: _____
(Authorized Signature)

Title: _____

8. Litigation Background (all projects in past 5 years resulting in partial or final settlement of the contract by arbitration or litigation in the courts):

Client	Contract Amount	Total \$ claims	Settlement \$
--------	-----------------	-----------------	---------------

a. _____

b. _____

9. Choose one of the following:

- Bidder has Industrial Insurance coverage for employees working in Washington as required in Title 51 RCW; or
- Bidder is not required to have Industrial Insurance coverage as required in Title 512 RCW.

10. Choose one of the following:

- Bidder's Washington Employment Security Department registration number is _____; or
- Bidder is not required to register with the Washington Employment Security Department pursuant to Title 50 RCW.

11. Choose one of the following:

- Bidder' Washington State Department of Revenue registration number is: _____; or
- Bidder is not required to register with the Washington State Department of Revenue pursuant to Title 82 RCW.

I am the _____ (title) of Bidder, have authority to bind Bidder, am over the age of 18, and have personal knowledge of the facts set forth above.

Dated this _____ day of _____, 2016, at _____ (city),
_____ (state).

Signature _____

Print Name _____

Title _____

End of Bidder's Qualification Certificate

III SUBCONTRACTORS LIST

The bidder shall submit, as part of the bid, the names of the subcontractors with whom the bidder, if awarded the contract, will subcontract for performance of the work. The bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the bidder must indicate which subcontractor will be used for which alternate. **Failure of the bidder to submit as part of the bid the names of such subcontractors or to name itself to perform such work or the naming of two or more subcontractors to perform the same work shall render the bidder's bid nonresponsive and, therefore, void.** This form is prepared in compliance with RCW 39.30.060 as amended. Bidder may provide additional pages if necessary.

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_____ :

Subcontractor Name _____ **WA License #** _____

Item Numbers _____

Description of work: _____

_____ :

Subcontractor Name _____ **WA License #** _____

Item Numbers _____

Description of work: _____

_____ :

Subcontractor Name _____ **WA License #** _____

Item Numbers _____

Description of work: _____

_____ :

Subcontractor Name _____ **WA License #** _____

Item Numbers _____

Description of work: _____

IV BID PROPOSAL DEPOSIT FORM

**BID BOND FORM
EXAMPLE**

Herewith find deposit in the form of a certified or cashier's check in the amount of \$ _____ which amount is not less than ten percent (10%) of the total bid.

Signature

BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT we _____ as Principal and _____ as Surety, are held and firmly bound unto the The Black Lake Special District, Washington, as Oblige in the penal sum of _____ dollars, for the payment of which the Principal and the Surety binds themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The condition of the obligation is such that if the Oblige shall make any award to the Principal for,

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according to the terms of the proposal or bid made by the Principal therefore, and the Principal shall duly make and enter into a Contract with the Oblige in accordance with the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Oblige; or if the Principal shall, in case of failure to do so, pay and forfeit to the Oblige the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Oblige, as penalty and liquidated damages the amount of this bond.

SIGNED, SEALED and DATED THIS _____ day of _____, _____.

Principal

Local Surety Address

Surety

Surety Phone No. Surety Fax No.

By _____

Return of Deposit in the Amount of \$ _____
Date _____, 20____

End of Bid Proposal Deposit Form

V PROPOSAL/CONSTRUCTION CONTRACT AND BID FORM

Contract No. 2016-01

Project: Black Lake Alum Treatment Project

Funding Agency: Black Lake Special District

Date: _____

CONSTRUCTION CONTRACT

THIS CONTRACT, made and entered into this ____ day of _____, 2016, shall be the agreed basis of performing the following work by and between the Black Lake Special District, hereinafter referred to as the Owner, and

Telephone _____ Fax _____

hereinafter referred to as the Contractor.

WITNESSETH: Whereas the parties hereto have mutually covenanted and by these presents do covenant and agree with each other as follows:

FIRST: The said Contractor agrees to furnish all material, labor, tools, equipment, apparatus, facilities, etc., necessary to perform and complete in a workmanship like manner the work called for in the contract documents entitled:

Project No. 2016-01
 Project Name: Black Lake Alum Treatment Project

Prepared by the Black Lake Special District according to the terms of the contract documents which shall include, but shall not be limited to, the accepted Proposal, General and Supplemental Conditions, Addenda, Specifications, Drawings, Bonds, Advertisement for Bids and this Contract.

SECOND: Time of Completion: The work to be performed under this contract shall commence as soon as the Contractor has been officially notified to proceed and shall be completed as stipulated in 1-08.5 Times for Completion. Time is of the essence of the Contract and Liquidated Damages based on direct and consequential damages for delay will be assessed against the Contractor for failure to complete the work within the dates specified in 1-08.5 Times for Completion.

Failure by the Contractor to meet the dates will subject the Contractor to liability for all damages suffered by the Black Lake Special District. By entering into this Contract, the Contractor acknowledges the need to meet the dates specified in 1-08.5 Times for Completion.

THIRD: In consideration of the Performance of the Work, herein contained, on the part of

IN WITNESS WHEREOF: The said Black Lake Special District has caused this Contract to be subscribed in its behalf and the said Contractor has signed this Contract the day and year first above written.

Contractor:

Owner:
Black Lake Special District

By _____

By _____

Title _____

Title _____

Date _____

Date _____

Washington State Contractor's
License No. _____

Federal Tax Id. No. _____

UBI. NO. _____

End of Proposal/Construction Contract and Bid Form

VI PERFORMANCE AND PAYMENT BOND**PERFORMANCE AND PAYMENT BOND****EXAMPLE**

KNOW ALL MEN BY THESE PRESENTS: THAT whereas the Black Lake Special District has awarded to

Contractor

hereinafter designated as the "Principal" a contract for work items, which contract consists of the Proposal/Agreement, together with the Contract Documents, Standard Specifications, Special Provisions, Addenda and Plans, all as hereto attached and made a part hereof, and more particularly described as

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and whereas said principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract:

NOW, THEREFORE, we the Principal and _____ a corporation, organized and existing under and by virtue of the laws of the State of _____, and duly authorized to do business in the State of Washington as surety, NAIC Code # _____; WAOIC/CIC Code # _____ are firmly bound unto the Black Lake Special District in the sum of:

(\$ _____)

lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bonded principal, his/her or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in said contract, and shall faithfully perform all the provision of such contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, at the time and in the manner therein specified; and shall pay all laborers, mechanics, subcontractors and material men, and all persons who shall supply such person or persons, or subcontractors, with provisions and supplies for the carrying on of such work on his/her or their parts; and shall indemnify and save harmless the Black Lake Special District, its officers and agents, from any damage or expense by reason of failure of performance as required by said contract, or any modifications thereof, or from defects appearing or developing in the material or workmanship provided or performed under said contract within a period of one year after acceptance thereof by the Black Lake Special District, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

And the said surety, for value received, hereby further stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed there under or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any change, extension of time, alterations or additions to the terms of the contract or the work or to the specifications.

IN WITNESS THEREOF, the said Principal and the said surety caused this bond and three (3) counterparts thereof to be signed and sealed by their duly authorized officers, this _____ day of _____, 20____.

TWO WITNESSES:

Principal

By: _____
Title: _____

ATTEST: (If Corporation)

CORPORATE SEAL

By: _____
Title: _____

APPROVED AS TO FORM:

BLACK LAKE SPECIAL DISTRICT

Surety
By: _____

By: _____
Black Lake Special District

Address of local office and agent
of Surety Company is:

VII AGREEMENT

State of Washington)
County of Thurston)

THIS AGREEMENT AND CONTRACT, made and entered into this

_____ day of _____, 20____, by and between the Black Lake Special District herein designated "Owner,"

and _____, herein designated as the "Contractor,"

WITNESSETH:

That WHEREAS the Owner heretofore caused to be prepared certain conditions for the construction of

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and the Contractor did on _____ day of _____, 20____, file with the Owner a proposal to construct said improvements and agreed to accept as payment therefor the sum fully stated and set forth in the Proposal, and

WHEREAS, the said Contract Documents fully and accurately described in terms and conditions upon which the Contractor proposes to furnish said equipment, labor, materials, and appurtenances and perform said work, together with the manner and time of furnishing same;

IT IS THEREFORE AGREED, first, that a copy of said Proposal and other Contract Documents filed with the Owner, as aforesaid, does, in all particulars, become a part of the Agreement and Contract by and between the parties hereto in all matters and things therein set forth and described; and further, that the Owner and the Contractor hereby accept and agree to the terms and conditions of said Contract Documents as filed as completely as if said terms, specifications, conditions, and plans were herein set out in full.

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VII AGREEMENT – continued

IN FAITH WHEREOF, witness the hand and seals of both parties hereto on the day and year in this Agreement first above written.

THE BLACK LAKE SPECIAL DISTRICT

By: _____

CONTRACTOR

By: _____ (Signature) _____ (Print Name)

Title: _____

Address: _____

Phone Number: (____) ____ - _____

End of Agreement

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DIVISION 1 – GENERAL REQUIREMENTS

INTRODUCTION

The following Amendments and Special Provisions shall be used in conjunction with the *Washington State Department of Transportation's Standard Specifications for Road, Bridge and Municipal Construction 2016* (WSDOT Standard Specifications, or "Standard Specifications") amended January 4, 2016. Additional specifications in the following contract sections are included for items not covered by the WSDOT Standard Specifications.

The following Amendments to the Standard Specifications are made a part of this contract and supersede any conflicting provisions of the Standard Specifications. Each Amendment contains all current revisions to the applicable section of the Standard Specifications and may include references which do not apply to this particular project.

SECTION 1-01 DEFINITIONS AND TERMS - LOCAL AGENCY

The following substitution of words shall prevail in the Standard Specifications:

Wherever the word "State" is used, it shall mean Black Lake Special District.

Wherever the words "Department, Department of Transportation" are used, they shall mean Black Lake Special District.

Wherever the words "Transportation Commission" are used, they shall mean the Board for the Black Lake Special District.

Wherever the words "Secretary, Secretary of Transportation" are used, they shall mean the Board for the Black Lake Special District.

Wherever the words "State Treasurer" are used, they shall mean The Board for the Black Lake Special District.

Wherever the words "State Auditor" are used, they shall mean Black Lake Special District Auditor.

Wherever, in the Contract, the specifications and other Contract documents, the following words and terms or pronouns in place of them are used, the meaning will be construed as follows:

Board, Board of Directors: The elective body having authority over Black Lake Special District matters as provided by law.

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Department, Public Works Department: The elective body having authority over Black Lake Special District matters as provided by law.

County Road Engineer: The Project Engineer for the Black Lake Special District and such agents as are authorized to act on his behalf.

Engineer: The Project Engineer or Black Lake Special District Biologist, acting directly or through his/her duly authorized representative.

Laboratory: The laboratory designated by the Project Engineer.

Owner: The entity that is a part of this contract, contracting under the official name set forth in the Agreement.

Item of Work: For the purpose of this project, an item of work shall be considered a unit of work. Payment will be made for actual work performed at Unit Contract Price for completed units of work.

SECTION 1-02 BID PROCEDURES AND CONDITIONS

1-02.1 Prequalification of Bidders

This section is replaced with the following:

The Contractor shall submit a bidder's qualification certificate as provided in this contract with the bid.

1-02.2 Plans and Specifications

This section is revised to read:

Contract Documents (Contract Form, Specifications and Bid Forms will be available online at <http://blacklakespecialdistrict.org/>).

After Contract award, Black Lake Special District shall supply Contractor with up to 3 sets of the Contract Documents. Contractor shall make all other copies of Contract Documents needed for completion of Contractor's work.

1-02.6 Preparation of Proposal

Paragraph five, item #1 is revised to read:

1. The Bidder shall list all Subcontractors expected to perform more than five percent (5%) of the contracted work on the bid form. Failure of the Bidder to submit

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as part of the bid the NAMES of such Subcontractors or to name itself to perform such work shall render the Bidder's bid non-responsive and, therefore, void.

This section is further supplemented with the following:

In accordance with the legislative findings and policies set forth in Chapter 39.19 RCW, Black Lake Special District encourages participation in all of its contracts by MWBE firms certified by the Office of Minority and Women's Business Enterprises (OMWBE). Participation may be either on a direct basis in response to this invitation or as a subcontractor to a bidder. However, unless required by federal statutes, regulations, grants, or contract terms referenced in the contract documents, no preference will be included in the evaluation of bids, no minimum level of MWBE participation shall be required as a condition for receiving an award and bids will not be rejected or considered non-responsive on that basis.

1-02.7 Bid Deposit

This section is supplemented with the following:

1. When the sum of the base bid plus all additive bid alternates is \$35,000.00 or less, bid deposit is not required.
2. When the sum of the base bid plus all additive alternatives is greater than \$35,000.00, a bid deposit of ten percent (10%) of the base bid amount is required.

1-02.9 Delivery of Proposal

This section is revised to read:

1. The proposal shall be emailed to:
info@blacklakespecialdistrict.org

The proposal time stamped and sent to:
Black Lake Special District in care of OrgSupport:
1520 – A Irving Street SW
Tumwater, WA 98512

2. The proposal shall be received by **4 pm on Monday, March 7, 2016.**
3. Prior to the bid opening, a Black Lake Special District representative will designate the official bid clock.
4. Any part of the bid proposal or bid modification not received prior to the time specified, per the designated bid clock, will not be considered and the bid will be returned to the bidder unopened.

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5. People with disabilities who wish to request special accommodation, (e.g., sign language interpreters, Braille, etc.) need to contact Black Lake Special District ten (10) working days prior to the scheduled bid opening.

1-02.11 Combination and Multiple Proposals

This section is deleted.

1-02.12 Public Opening of Proposals

This section is supplemented with the following:

Bidders may obtain bid results after March 14, 2016, from Black Lake Special District by calling (360) 867-8814 or by emailing Lake Sintzi at info@blacklakespecialdistrict.org.

1-02.13 Irregular Proposals

This section is supplemented with the following:

1. A proposal may be considered irregular and may be rejected if:
 - f) The solicitation includes Additive Bid Items and the proposal fails to include a unit price for every Additive Bid Item. If bidding on all items is not required, bidders should insert the words “no bid” in the space provided for any item on which no price is submitted.

Proposals received by the Black Lake Special District will be reviewed for responsiveness. The Black Lake Special District reserves the right to reject any and all proposals, including without limitation, non-conforming, unbalanced, or conditional or otherwise non-responsive Proposals. The Black Lake Special District may also reject the proposal of any Proposer if the Black Lake Special District believes that it would not be in the best interest of the Black Lake Special District to make an award to that Proposer. The Black Lake Special District also reserves the right, but is not obligated to, waive all informalities not involving price, time or changes in the Goods and Special Services. Finally, the Black Lake Special District reserves the right to reject all Proposals.

1-02.16 Additive or Deductive Bid Items (NEW)

This section is added:

The low bidder, for purposes of award, shall be the responsive bidder offering the low aggregate amount for the base bid item, plus additive or deductive bid alternates selected by the Black Lake Special District and within funds available for the project.

The bidder agrees to hold all bid alternate prices for forty-five (45) days from date of bid opening.

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1-02.17 Bid Amounts (NEW)

This section is added:

The Bidder agrees to hold the base bid prices for forty-five (45) days from date of bid opening.

SECTION 1-03 AWARD AND EXECUTION OF CONTRACT

1-03.3 Execution of Contract

This section is revised to read:

The notice of award is anticipated to be on **March 14, 2016**. The Notice to Proceed will occur when the contract is signed by the bidder and the Black Lake Special District.

The bidder will return to Black Lake Special District a signed contract, insurance certificate(s) and bonds within ten (10) days after receipt of contract. If the apparent successful bidder fails to sign all contractual documents or provide the bond and insurance as required or return the documents within ten (10) days after receipt of the contract, the Owner may terminate the award of the contract.

SECTION 1-04 SCOPE OF WORK

1-04.4 Changes

This section is supplemented with the following:

If Owner desires to order a change in the Work, it may request a written Change Order proposal from Contractor.

1. Due to the short and critical duration of these types of projects, Contractor shall submit a Change Order proposal within 24 hours of the request from Owner, or within such other period as mutually agreed.
2. Contractor's Change Order proposal shall be for full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity reasonably occasioned by the change in Work.
3. Upon receipt of the Change Order proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with the Contractor.

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4. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner's written approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.
5. If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Contract Sum specified in the Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.
6. A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Black Lake Special District within 24 hours of the occurrence of the event giving rise to the request. For purposes of this part, "occurrence" means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If the Contractor believes it is entitled to an adjustment in the Contract Sum, Contractor shall immediately notify Black Lake Special District and begin to keep and maintain complete, accurate and specific daily records. Contractor shall give Black Lake Special District access to any such records and, if requested, shall promptly furnish copies of such records to Owner.
7. Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that occurred more than 24 hours before Contractor's written notice to Black Lake Special District. The written notice shall set forth, at a minimum, a description of:
 - a. The event giving rise to the request for an equitable adjustment in the Contract Sum;
 - b. The nature of the impacts to Contractor and Subcontractors, if any; and,
 - c. To the extent possible, the amount of the adjustment in Contract Sum requested.
8. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
9. When the request for compensation relates to a delay or other change in Contract Time, Contractor shall demonstrate the impact on the critical path of the schedule attributable to the change of Work or event(s) giving rise to the request for equitable

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adjustment. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event:

- a. Had a specific impact on the critical path and, except in case of concurrent delay, was the sole cause of such impact; and
- b. Could not have been avoided by re-sequencing of the Work or other reasonable alternatives.

SECTION 1-07 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.2 State Taxes

Delete 1-07.2(1) and 1-07.2(2) and replace with the following:

The total bid amounts shall include Washington State Sales Tax (WSST) as a line item. All other taxes imposed by law shall be included in the bid amount. The Black Lake Special District will include WSST in progress payments according to the percent of completion. The Contractor shall pay the WSST to the Department of Revenue and shall furnish proof of payment to the Black Lake Special District.

[Note: Contractor must bond for contract amount plus the WSST.]

1-07.5 Environmental Regulations

1-07.5(1) General

This section is supplemented with the following:

This specification describes requirements originating from the Washington Department of Fish and Wildlife (WDFW), U.S. Fish & Wildlife Service (USFWS) and U.S. Army Corps of Engineers (ACOE) whose collective responsibility in this case is to make sure aquatic resources and fish communities are adequately protected during construction projects.

The contractor is advised that many of the requirements for protection of fish life, water quality, etc., are shown on drawings, described in Division 8, and will be paid under the items of work described in this contract.

1-07.5(2) State Department of Fish and Wildlife

This section is supplemented with the following:

10. Contractor shall read the Aquatic Plant and Algae Management General Permit and shall keep a copy of the permit on site during all work days.

1-07.5(3) State Department of Ecology

This section is supplemented with the following:

9. Prepare a Spill Prevention, Control and Countermeasures (SPCC) Plan as outlined in 1-07.15(1). Oil absorbent pads and personnel trained in spill prevention and control will be on site during all heavy equipment operations. The SPCC Plan shall include description of any temporary on-shore chemical storage facilities and proposed location for security fencing and/or other measures necessary to deter vandalism and prevent tampering with chemical storage facilities.
10. Inspect heavy equipment at least on a daily basis for any leaks of petroleum products and repair immediately as needed.
11. Overnight parking of heavy equipment shall be at least 50 feet from the shore edge of pavement.
12. Pick up small garbage items at the site at the end of each workday and at the conclusion of project construction.
13. Steam-clean heavy equipment before shipping to the project site.

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1-07.6 Permits and Licenses

This section is supplemented with the following:

The Contractor shall be given a copy of the draft Aquatic Plant and Algae Management General Permit (Appendix E). The Contractor shall comply with all permit requirements and keep a copy of the permits on site at all times.

1-07.9 Wages

This section is supplemented with the following:

1-07.9(5) Required Documents

This section is deleted and replaced with the following:

The Contractor shall provide The Black Lake Special District with a schedule of personnel labor and equipment rates.

1-07.18 Public Liability and Property Damage Insurance

This section is supplemented with the following:

14. An Environmental Pollution Liability insurance policy is required to provide coverage for claims involving remediation, disposal or other handling of pollutants arising out of:
 - a. Contractor's operations related to this project.
 - b. Transportation of hazardous materials to or from any site related to this project, including, but not limited to, the project site and any other site, including those owned by the Contractor or for which the Contractor is responsible.
 - c. Remediation, abatement, repair, maintenance or other work with lead-based paint or materials containing asbestos.

Such Environmental Pollution Liability policy shall provide the following minimum coverage for Bodily Injury and Property Damage:

\$1,000,000 per occurrence

The following paragraphs of this section is revised to read:

11. Prior to contract execution, the Contractor shall file with the Black Lake Special District, 120 State Avenue NE, #303, Olympia, Washington 98501, ACORD Form Certificates of Insurance evidencing the minimum insurance coverage required under these specifications.

12. The Contractor shall provide written notice to the Engineer of any policy cancellations and provide the Black Lake Special District, 120 State Avenue NE, #303, Olympia, Washington 98501, notice of any policy cancellation within two business days of receipt of cancellation.

SECTION 1-08 PROSECUTION AND PROGRESS

1-08.5 Times for Completion

This section is revised to read:

Assuming a notice to proceed by **March 28, 2016**, the Contractor shall accomplish all work in Black Lake between **April 11, 2016, and April 29, 2016**. Site preparation and other preliminary work (not requiring entry into a stream) may be started immediately after notice to proceed subject to submittal requirements as stated in these specifications. Liquidated damages shall apply for every calendar day until the work is complete for the following milestone dates:

April 28, 2016

All work on Black Lake as described in this specifications shall be completed.

April 29, 2016

All equipment and materials shall be de-mobilized and cleared from the site.

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1-08.9 Liquidated Damages

This section is revised to read:

The Contractor further agrees that, from the compensation otherwise to be paid, the Owner may charge actual costs to the Contract for any time over the agreed to completion date where work remains uncompleted, which sum is agreed upon as the liquidated damages which the Owner will sustain in case of the failure of the Contractor to complete the work in the time stipulated and this sum is not to be construed as in any sense a penalty. For the purpose of calculating Liquidated Damages, T shall be 18 working days as calculated from a notice to proceed date of April 11, 2016, to April 29, 2016. Liquidated damages shall include but not limited to:

1. Any fines by Permitting Agencies for work not being completed within the time frame stipulation in the permit.
2. Any costs imposed by the local authorities due to the work not being completed on time.
3. Additional special inspections that might be required.
4. It is not the intent of Black Lake Special District to recoup our extra management expenses.

SECTION 1-09 MEASUREMENT AND PAYMENT

1-09.7 Mobilization

This section is supplemented with the following:

Mobilization shall include, but not be limited to, the following items: the movement of the Contractor's personnel, equipment, supplies, barges, chemical storage tanks, and incidentals to the project site; the establishment of his office, buildings, and other facilities necessary for work on the project; providing sanitary facilities for the Contractor's personnel; obtaining permits or licenses required to complete the project not furnished; development and posting of shoreline signage as required by the Aquatic Plant and Algae Management General Permit and described herein; and other work and operations which must be performed or costs that must be incurred.

The Contractor shall provide and install all required shoreline and public access notification signs per the posting requirements of the Aquatic Plant and Algae Management General Permit (see Appendix E) and the Department of Ecology. Contractor shall comply with the following requirements of the Aquatic Plant and Algae Management General Permit for posting the lake shoreline.

1. General requirements include the following:
 - a. Use the template provided in Appendix F.
 - b. Post signs no more than 48 hours prior to treatment.
 - c. Post signs so that they are secure from the normal effects of weather and water currents, but cause minimal damage to property.

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- d. Make best efforts to ensure that the signs remain in place and are legible until removed.
 - e. Remove all signs between 2 and 10 days after the treatment ends.
 - f. Posting shoreline public access areas and entrances to the lake pathway with 2- by 3-foot signs:
 - g. The Contractor must post 2- by 3-foot signs at the public access areas and entrances to the lake pathway at a total of ten locations designated on Appendix B.
 - h. The Contractor must post the signs to face both the water and the shore and site them on the shore side of the pathway where they are visible to pathway users and do not obstruct pathway use.
 - i. Signs must be a minimum size of 2- by 3-foot and constructed of durable weather-resistant material.
 - j. The Contractor must attach an 8 ½- by 11-inch weather resistant map of the lake to each sign designating the following:
 - i. "Treatment area includes the entire lake area below a depth of 5 feet for both chemicals" (located within the lake area)
 - ii. Mark and label the "Start and Stop Address: WDFW Boat Launch, Latitude 46.9830314, Longitude -122.9731335"
 - iii. Mark and label the "Reader's Location".
 - k. Signs must include the word "CAUTION" in bold black type at least 2 inches high, and use a font at least ½ inches high for all other words.
2. Posting privately-owned and publicly-owned shoreline properties (excluding public access areas) with 8 ½- x 11-inch signs:
- a. The Contractor must post 8 ½- by 11-inch signs at every waterfront residence or business. There are approximately 200 total businesses and private residences along the waterfront.
 - b. The Contractor must post the signs to face both the water and the shore and site them on the shore side of the pathway where they are visible to pathway users and do not obstruct pathway use.
 - c. Signs must be a minimum size of 8 ½- by 11-inch and protected from constructed of durable weather-resistant material.

1-09.11(3) Time Limitation and Jurisdiction

This section is deleted.

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NEW SPECIAL CONDITIONS

This section is added:

SECTION 1-11 SAFETY PRECAUTIONS (NEW)

1. Material Safety Data Sheets (MSDS) for all chemicals (including paints) used in the performance of the contractor's duties must be identified, posted on a specified bulletin board, and provided to the Engineer at least 10 working days in advance of using the material (s). The Contractor shall comply with MSDS recommended practice.
2. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the work.
3. In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the work and other persons who may be affected by the work; prevent damage to materials, supplies and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with Chapter 296-800 WAC and all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the work may affect them.
4. Contractor shall maintain an accurate record of exposure data on all incidents relating to the work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies or equipment. Contractor shall immediately report any such incident to the Black Lake Special District and appropriate jurisdictions. Black Lake Special District shall, at all times, have a right of access to all records of exposure.
5. All work shall be performed with due regard for the safety of the public. Contractor shall perform the work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor's responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.
6. In an emergency affecting the safety of life or damage of adjoining property, the Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if authorized or instructed.
7. Nothing provided in this section shall be construed as imposing any duty upon the Black Lake Special District with regard to, or as constituting any express or implied assump-

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tion of control or responsibility over, project site safety, or over any other safety conditions related to employees or agents of the Contractor or any of its Subcontractors, or the public.

8. In-water work is subject to several hazards, docks, boats, and underwater hazards such as sunken logs, debris, boats, or utilities. An approved site specific Health and Safety Plan shall be required to address any hazardous condition or other unforeseen site conditions that may be encountered.
9. All chemicals used shall be considered from the perspective of their possible effects on our living collection, staff, and visitors. All possible protective devices, safeguards, shields, containment and disposal methods shall be initiated and continued throughout the period of Contract Occupancy to protect the living collection, staff, and visitors.
10. The Contractor shall provide barricades, safety guards, temporary fencing, signage and/or other methods to secure trenches, open excavations, and other unsafe conditions resulting from the project work. Contractor shall adhere to all safety regulations.
11. The Contractor shall steam clean all exposed areas of boats, barges, or other vessels to prevent importation and transport of non-native species.
12. The Contractor shall utilize fish friendly, biodegradable, hydraulic fluids on all equipment located on site.

SECTION 1-12 TEMPORARY UTILITIES (NEW)

This section is added:

Contractor shall supply and maintain all necessary and temporary electrical services and required water as needed for construction of this project. Any water required on site will be hauled by the Contractor from a safe and legal source. No water may be drawn from the site (lake, inlets or outlets).

Contractor shall locate all existing utilities in the work area prior to the start of work.

Contractor shall provide their own sanitary facilities and manage drinking water for all those connected with the work in accordance with WISHA and Health Department requirements.

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DIVISION 8 – MISCELLANEOUS CONSTRUCTION

8-26 CHEMICAL INJECTION (NEW)

8-26.1 Description

The work described in this section includes all work necessary for applying liquid aluminum sulfate (alum) and liquid sodium aluminate (buffer) for phosphorus control in Black Lake.

8-26.2 Materials

8-26.2(1) Alum (Aluminum Sulfate)

1. Upon approval by the Black Lake Special District, the Contractor shall procure 53,560 gallons of liquid aluminum sulfate ($\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$) for Black Lake. Alum shall meet the following specifications:
 - a. Grade = Drinking Water Treatment Grade
 - b. pH = 2.0 to 2.4
 - c. Specific Gravity at 70°F = 1.333 to 1.337
 - d. Freezing Point = -16°C
 - e. Boiling Point = 101°C (214°F)
 - f. Total Water-Soluble Aluminum of 4.2 to 4.4 percent or as Al_2O_3 , 8.0 to 8.4 percent
2. The total water-soluble iron (expressed as Fe_2O_3) content of aluminum sulfate shall be no more than 0.02 percent, on a basis of 8.1 percent Al_2O_3 in liquid alum. In liquid alum, the water-insoluble matter shall not exceed 0.02 percent. At a minimum, aluminum sulfate shall conform with the “American National Standards Institute/National Sanitation Foundation” (ANSI/NSF) Standard 60 Drinking Water Treatment Chemicals – Health Effects (2005 and previous), or Standard 61 Drinking Water System Components – Health Effects (2005 and previous) for use in drinking water.
3. The aluminum sulfate supplied shall contain no soluble mineral or organic substances in quantities that are capable of producing deleterious or injurious effects on public health or water quality.
4. The Contractor shall provide the Black Lake Special District and their on-site representative with the manufacturer’s material quality assurance certification with each truck delivery to show that procurement meets specifications. The alum in each delivery shall be approved by the Black Lake Special District on-site representative prior to applying the alum in Black Lake.

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8-26.2(2) Sodium Aluminate

1. Upon approval by the Black Lake Special District, the Contractor shall procure 26,780 gallons of sodium aluminate at 32 to 38 percent available soluble sodium aluminate for Black Lake.
2. Sodium aluminate (NaAlO_2) is produced from the reaction of alumina tri-hydrate with caustic soda. Liquid sodium aluminate shall contain no more than 0.5 percent insoluble matter. Liquid sodium aluminate shall contain a minimum of 32 percent available soluble sodium aluminate to a maximum of 38 percent. Liquid sodium aluminate shall have excess sodium oxide of at least 4 percent to ensure complete combination with the aluminum oxide. At a minimum, sodium aluminate shall conform with the "American National Standards Institute/National Sanitation Foundation" (ANSI/NSF) Standard 60 Drinking Water Treatment Chemicals – Health Effects (2005 and previous), or Standard 61 Drinking Water System Components – Health Effects (2005 and previous) for use in drinking water.
3. The application ratio of alum and sodium aluminate may need to be modified and quantities of sodium aluminate revised if liquid sodium aluminate procured by the Contractor contains more than 32 percent available sodium aluminate, or if the results of the jar tests conducted immediately prior to treatment indicate that a different ratio is required.
4. The sodium aluminate supplied in accordance with this standard shall contain no substances in quantities capable of producing deleterious or injurious effects on public health or water quality.
5. The Contractor shall provide Black Lake Special District and their on-site representative with the manufacturer's material quality assurance certification with each truck delivery to show that procurement meets specifications. The sodium aluminate in each delivery shall be approved by the Black Lake Special District on-site representative prior to applying the chemical in Black Lake.

8-26.2(3) Equipment and Materials for Application

6. The Contractor shall provide all equipment, labor, and materials necessary to perform the work. This shall include, but not be limited to:
 - a. Boat(s) or barge(s) capable of traversing the lake and applying the alum and buffer at appropriate rates to all portions of the lake.
 - b. On-shore chemical storage tanks and associated spill containment equipment that meet local state and federal regulations. On-shore storage tanks are recommended but not required if the rate of application can

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keep pace with delivery of chemicals. If on-shore storage tanks are used, separate tanks shall be provided for each chemical. All on-shore storage tanks shall be fabricated out of HDPE or other suitable material.

- c. On-board chemical storage tanks and secondary spill containment equipment that meet local state and federal regulations.
- d. The appropriate pumps and boom and spreader applicators to control and evenly distribute chemical dosing for both liquid aluminum sulfate and sodium aluminate simultaneously (See Appendix D for illustration of appropriate application boom set up). Both chemicals are to be applied to the water directly and simultaneously so that they mix immediately upon entering the water but not before. The alum and sodium aluminate should NOT come in contact with one another outside of the water.
- e. A GPS-linked computer system for barge (boat) guidance that provides chemical dosing control for both aluminum sulfate and sodium aluminate pumping rates based on boat speed and maps/documents areas of the lake already treated. The barge (boat) must have sonar equipment to record water depth.
- f. Trained staff to safely and effectively implement the alum treatment
- g. Public convenience & safety and temporary traffic control provisions in accordance with Section 1-10 of the Standard Specifications.

8-26.3 Construction Requirements

8-26.3(1) Submittals

The Contractor shall submit the following for review and approval by the Black Lake Special District and their on-site representative:

1. Plan of Work – shall be submitted prior to the procurement of materials and shall include, at a minimum, the following items:
 - a. Explanation of plans and schedule for the timely delivery, storage and transfer of all chemicals
 - b. Photographs and/or drawings and description of the application equipment to be used on the lake, including application boom set up, width of application path, on-board storage capacity of both chemicals, and means of locomotion;
 - c. Description of approach to application in the shallow areas of the lake, with specific reference to how to move the treatment boat around in these

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areas and the application technique to apply the chemicals within these shallower areas (treatment shall be to all areas of the lake within the 5-foot depth contour as indicated on the Black Lake Treatment and Signage Locations Map in Appendix B), if different than the application technique to be used in deeper areas of the lake

- d. Method of chemical distribution, documenting the control of chemical pumping rate into the lake based on application vessel speed, real-time GPS navigation, and bathymetric measurements to ensure an effective dose of 12.9 mg Al/m² throughout all areas of the lake within the 5-foot depth contour (see Appendix B).
 - e. Description of any proposed backup systems to minimize down time
 - f. Description of land-to-vessel chemical transfer method(s), including spill prevention and response protocols to be employed
 - g. Anticipated treatment capacity (acre/hour and gallons/day)
 - h. Plan for decontaminating all equipment prior to bringing equipment to the lake to prevent the introduction of any aquatic invasive species into the lake. This includes, but is not limited to, de-contamination of barge(s), boat(s), boat and vehicle trailers and tires, all on-board gear, hoses, pumps, spreader lines, booms, barge/boat motors, personal gear such as boots, and any on-shore equipment or gear, including storage tanks, that could come in contact with lake water or allow aquatic invasive species to be washed into the lake. Minimum decontamination procedures are the Washington State Department of Fish and Wildlife Invasive Species Management Protocols, Level 1 Decontamination Protocol – Basic and, if the equipment is known to have been exposed to aquatic invasive species, Special Protocols – Boats and Other Large Aquatic Conveyances Transported Overland. These protocols may be found at <http://wdfw.wa.gov/publications/01490/wdfw01490.pdf>
 - i. Emergency contact information for all Contractor personnel on site.
 - j. Product data for all products used per 8-26.2.
2. Health and Safety Plan – shall, at a minimum, identify potential hazards, including docks, boats, and underwater hazards such as sunken logs, debris, boats, or utilities, address any hazardous condition or other unforeseen site conditions that may be encountered.

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3. Spill prevention, control, and contingency plan (SPCC Plan) shall be prepared per 1-07.5(3) and 1-07.15(1).
4. Application Log - shall include, at a minimum, the following items to be submitted to the on-site Black Lake Special District representative and construction manager daily during alum application:
 - a. Date of work;
 - b. Daily starting time and ending time, hours of application;
 - c. Workforce;
 - d. Weather conditions;
 - e. Quantity of material applied (gallons); computer data indicating application of liquid alum and sodium aluminate in the specified dose ratio;
 - f. Approximate location (on map) and acreage of treatment;
 - g. Summary of truck deliveries, including percent Al in both alum and sodium aluminate delivered as well as the percent of soluble sodium aluminate in the liquid sodium aluminate delivered;
 - h. The Contractor shall provide the Black Lake Special District and their on-site representative with the manufacturer's material quality assurance certification with each truck delivery to show that procurement meets specifications. The alum and sodium aluminate in each delivery shall be approved by the Black Lake Special District on-site representative prior to any offloading or applying the alum and/or sodium aluminate Black Lake.

These logs shall be submitted to the on-site Black Lake Special District representative at the end of each day except for item h that will be submitted at the time of chemical truck delivery for both alum and sodium aluminate to site for each truck before any offloading can occur.

5. Shoreline Notification Sign Proofs.

8-26.3(2) Alum and Sodium Aluminate Application

8-26.3(2)A Staging

1. The Contractor shall be responsible for all staging area setup, security, cleanup, and restoration to its original condition following completion of the application. The staging

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area will be left in the same condition as before the operation began, photo-documented and verified by the Black Lake Special District prior to the acceptance of work.

2. The staging area is located at the WDFW Boat Launch (see Appendix C for access and staging map). The staging area is located within a recreational area near a residential area. The Contractor shall take steps to minimize impacts to the park and lake users due to noise, parking, safety, equipment and supply storage, smells, and general condition of the site. The Contractor shall place security fencing around all equipment and storage tanks remaining on-site during non-working hours. Work on-site shall generally occur between 7 AM and 7 PM, Monday through Friday. Work on weekend days and holidays shall not be allowed.

8-26.3(2)B Preparation

1. The Contractor shall be responsible for locating all utilities. Prior to mobilization the Contractor shall call in all necessary utility locate requests including a locate request to the Parks Department.
2. The Contractor shall protect structures, utilities, sidewalks, roadways, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, or other hazards created by work associated with the application of liquid alum and sodium aluminate, including but not limited to, the transport and delivery of chemicals, chemical storage tanks, and chemical spills. During and at the completion of the application of liquid alum and sodium aluminate, the Contractor shall conduct all operations in such a way as to:
 - a. Comply with any and all permit conditions for this project
 - b. Prevent damage to the lake, equipment, and surrounding properties
 - c. Prevent damage to the aquatic environment by using a biodegradable hydraulic fluid
 - d. Prevent damage to the lake by ensuring that no aquatic invasive species are introduced into the lake. This shall include decontaminating all equipment and gear that will come into contact with lake water prior to bringing such equipment to the staging area.
 - e. Maintain orderly appearance at the work site while the treatment is occurring

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- f. Prevent damage to the aquatic environment by implementing temporary erosion and sediment control measures, if directed by the Black Lake Special District
- g. Prevent damage to the aquatic environment if temporary on-shore storage tanks are used
- h. Prevent damage to all utilities and below ground infrastructure including irrigation equipment.

8-26.3(2)C Chemical Application

1. The contractor shall simultaneously apply the specified amounts and qualities of aluminum sulfate and sodium aluminate at a volumetric ratio of approximately 2:1 (alum: sodium aluminate). This ratio will provide 0.44 kg Al from two gallons of liquid alum and 0.55 kg Al from one gallon of liquid sodium aluminate, given a concentration of 4.4 percent of total water-soluble aluminum and a specific gravity of 1.337 g/mL in the alum, and of 32 percent of available soluble sodium aluminate and a specific gravity of 1.40 g/mL in the buffer. All areas of the lake within the 5-foot contour will be treated at 12.9 mg Al/m². See Appendix B for a lake bathymetry map.
 - a. The alum and sodium aluminate application shall occur between April 11, 2016, and April 29, 2016, to avoid conflict with the opening day of fishing and periods of high recreational use of the lake. The application from start to finish shall be completed within 4 working days, with 2 additional days for mobilization and another additional 2 days for demobilization.
 - b. Application of the alum and sodium aluminate shall take place after the lake water temperature has risen to over 5.5° C (42° F) throughout the first 4 meters of the water column. Application will take place only when the wind speed is less than 15 mph at the lake surface, as required by the Aquatic Plant and Algae Management General Permit.
 - c. A mixture of liquid aluminum sulfate (alum as Al₂(SO₄)₃*14H₂O) and sodium aluminate (NaAlO₂) shall be applied to the lake surface or injected into the lake from a moving barge or boat. The barge/boat position in the lake shall be controlled by a satellite guiding system (GPS) to continuously adjust the application rate of liquid alum and sodium aluminate mixture (2 gallons alum to 1 gallon sodium aluminate, assuming 32 percent soluble sodium aluminate concentration), based on boat speed. All areas of the lake within the 5-foot contour will be treated at 12.9 mg Al/m². This will ensure complete and uniform chemical coverage during application.
 - d. The Contractor shall distribute the chemicals at a minimum application rate of 20,000 gallons per day of combined alum and sodium aluminate. The boom system for chemical distribution shall be substantially similar to

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the illustration in Appendix D. The chemicals are to be delivered to the lake water at an approximate depth of 1 to 2 inches below the water surface from a minimum of 12 pairs, up to a maximum of 24 pairs, of alum and sodium aluminate injection tubes (nozzles or small hoses) spaced 8 to 12 inches between pairs and with the alum and sodium aluminate injection tubes within each pair spaced 2 to 4 inches apart. The injection tubes shall be alternating so that the closest tubes in each direction are always tubes of the other chemical. The treatment shall not begin until the boom system is approved on-site by the on-site Black Lake Special District representative.

- e. The Contractor shall apply a full chemical allotment of liquid alum and liquid sodium aluminate to Black Lake. The effective dose of aluminum to be applied to all areas of the lake within the 5-foot contour shall be 12.9 mg Al/m² (see Appendix B for treatment area).
- f. The Contractor shall apply the full chemical allotment, as defined above, in a ratio of two gallons alum to one gallon sodium aluminate (assuming 32 percent soluble sodium aluminate concentration) with an accuracy of ± 3 percent. The chemicals must be simultaneously distributed so that the entire treatment area is uniformly covered, starting with the shallow areas and finishing in the deeper section of the lake. Computerized barge (boat) guidance and chemical metering control shall be used to ensure that the chemicals are distributed simultaneously and in the correct ratio.
- g. In accordance with the Aquatic Plant and Algae Management General Permit coverage issued to the Black Lake Special District by the Washington State Department of Ecology, the lake pH, and if needed, alkalinity, will be monitored by the Black Lake Special District or its representative in surface water samples collected one (1) meter below the lake surface and at one (1) meter above the lake bottom each morning before application begins, and one (1) hour following application each day.
- h. Prior to beginning the lake alum treatment (0.5 to 48 hours before), the Black Lake Special District or its representative will conduct a field test at the lake in a bucket or barrel using alum and sodium aluminate at 1.9 mg Al/L to verify that treated water is above pH 6.0 after addition and mixing (0.25 to 0.5 hours after being dosed).
- i. Work shall be suspended if the pH of lake water is consistently less than 6.0 (± 0.05) or greater than 8.7 (± 0.05) in the collected water samples.
- j. The threshold for re-starting treatment shall be a pH between 6.2 and 8.4 (± 0.05) and an alkalinity of at least 12 mg/L (± 0.5 mg/L).

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materials described in Section 8-26.2 (3) Equipment and Materials for Application for the work described in this Section 8-26 Chemical Injection shall be incidental to and included in the bid item price for “Alum and Sodium Aluminate Application”, described herein.

The contract price per lump sum for “Submittals” shall include full compensation for the labor and materials necessary for the development and preparation of an approved Health and Safety Plan, and Plan of Work as described in these specifications. The SPCC Plan shall be developed and paid for under Section 1-07.15(1) of the Standard Specifications.

“Alum and Sodium Aluminate Application”, per gallon, shall include full compensation for the materials, labor, supplies, and other incidental costs necessary for the alum and sodium aluminate distribution system and application of chemicals as described in these Special Provisions, including any cost for chemical storage tanks. Preparation of the site and staging area are incidental to this bid item.

Alum (Aluminum Sulfate)	Gallon
Sodium Aluminate	Gallon
Submittals	Lump Sum
Alum and Sodium Aluminate Application	Gallon

APPENDIX A

Treatment Plan

DRAFT
BLACK LAKE
ALUM TREATMENT PLAN

Prepared for
Black Lake Special District

Prepared by
Herrera Environmental Consultants, Inc.



Note:

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

BLACK LAKE ALUM TREATMENT PLAN

Prepared for
Black Lake Special District
120 State Avenue Northeast, No. 303
Olympia, Washington 98501

Prepared by
Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
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January 22, 2016 DRAFT

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EXECUTIVE SUMMARY

Black Lake, located in Olympia, Washington, has high nutrient levels that result in cyanobacteria (blue-green algae) blooms. These blooms have occurred in most years since routine lake monitoring began in 1992. Water quality data collected by Thurston County since 1992 shows that Black Lake is eutrophic (high nutrients and algae) due to high phosphorus concentrations. Lake sediments are a primary source of the phosphorus during summer when it is released from iron as anoxic (no oxygen) conditions develop in the bottom waters. The excess phosphorus fuels excess cyanobacteria that float to the surface to form scums and often produce various cyanotoxins (chemicals which are toxic to humans, mammals, and waterfowl).

The Black Lake Special District is committed to improving water quality in Black Lake and funded preparation of the Black Lake Phosphorus and Algae Control Plan (Herrera 2015a) to identify the measures needed to reduce phosphorus inputs to Black Lake, and control the production of cyanobacteria and toxic algal blooms by accomplishing the following objectives:

- Develop a water and phosphorus budget to estimate the amount and sources of phosphorus in the lake
- Analyze the lake bottom sediments to determine the amount of alum (aluminum sulfate used with the buffer sodium aluminate) or Phoslock® (lanthanum treated clay) that would be needed to inactivate sediment phosphorus
- Evaluate alum and Phoslock® treatment methods to control phosphorus sources on a short-term and long-term basis
- Develop a conceptual plan to control phosphorus (and therefore cyanobacteria) using alum

A water budget and phosphorus budget were developed for three study years (2010–2012) using an existing watershed model and lake water quality data. The water budget indicates that the primary sources of water flowing into Black Lake on an annual basis are surface inflows (77 percent) and shallow groundwater (14 percent).

The phosphorus budget focused on the summer monitoring period (May through October) when lake data were available for calculating net internal loading from mass balance equations. On average, 60 percent of the total phosphorus loading during the summer months came from net internal loading, 35 percent came from surface inflows, and 5 percent came from shallow groundwater inflow. Because internal loading is a significant source of phosphorus in Black Lake during the summer algae bloom period, a whole lake alum dose was identified as the most appropriate method to inactivate mobile sediment phosphorus. Phoslock® was excluded from consideration due to high cost and poor longevity.

Three alternative alum treatment scenarios were considered that differ in the timing of the treatment due to uncertainties in funding, permitting, and contractor availability. The Spring

2016 Full Treatment Scenario was selected as the preferred scenario because it was the least cost and allowed more time for proper planning, permitting, and funding.

The purpose of this Black Lake Alum Treatment Plan is to refine the alum dose and cost estimate, provide additional details about the treatment procedures and timing, and present an alum treatment oversight and monitoring plan that meets permit requirements.

The alum dose initially calculated in the previous study was revised in consideration of recent developments in alum treatment technology and other factors. The alum dose was revised based on the following factors:

- The biogenic phosphorus concentration was reduced from 163 to 95 mg/kg to include only the active fraction as an inactivation target because it is most susceptible to mineralization by sediment microbes and release to the water.
- The ratio of aluminum added to aluminum phosphorus formed was reduced from 20 to 10 because active biogenic phosphorus (95 mg/kg) was targeted for inactivation in addition to the immediately reactive mobile phosphorus (30 mg/kg).
- The treatment area was expanded from below a depth of 15 feet (412 acres) to below a depth of 5 feet (509 acres) to include inactivation of shallow sediments that may release phosphorus when oxygen is present in the overlying waters, but absent in the sediments due to microbial activity.

The revised aluminum dose is 1.9 mg Al/L on a volumetric basis and 12.9 g Al/m² on an areal basis. This dose is approximately 40 percent of the original dose of 4.8 mg Al/L on a volumetric basis and 39 g Al/m² on an areal basis (Herrera 2015a). Comparison of this dose to results of other alum treated lakes in Washington suggests that the Black Lake alum treatment will last at least 5 years, and may last up to 10 years depending on lake conditions and watershed inputs.

A total of 53,560 gallons of alum and 26,780 gallons of sodium aluminate (buffer) will be applied to Black Lake by an experienced contractor. These amounts are based on the amount of aluminum present in liquid alum (0.22 kg/gallon) and sodium aluminate (0.55 kg/gallon), and a ratio of 2 parts alum to 1 part sodium aluminate (by volume) to prevent a change in the pH of lake waters. Based on a truck capacity of 4,500 gallons, a total of 12 trucks will be required for the alum and 6 trucks for the sodium aluminate. It is expected to take approximately 3 to 4 days to apply these materials.

The treatment will occur between April 11 and April 29, 2016, when the lake waters have sufficiently warmed, and to minimize potential interference with recreational use of the lake and public boat launch. The treatment will be staged at the Washington Department of Wildlife public boat launch. This launch has recently been improved, and has sufficient space for truck access, two chemical storage tanks, and public use during the treatment.

The contractor will apply the alum and sodium aluminate evenly over the treatment area by injecting the two chemicals simultaneously below the water surface from a boom distribution system on a boat or barge. Herrera will provide an engineer to oversee the treatment and will monitor water quality to ensure proper application and prevention of impacts to fish from changes in the pH of lake waters.

The alum treatment will be conducted in accordance with Ecology's Aquatic Plant and Algae Management General Permit. This permit includes treatment restrictions, monitoring requirements, and public notification requirements. There are no recreational use restrictions for alum treatments. A detailed water quality monitoring plan is included in this treatment plan that describes procedures for short-term and long-term effects monitoring in addition to the permit-required monitoring of pH during the treatment.

1. INTRODUCTION

Black Lake, located in Olympia, Washington, has high nutrient levels that result in cyanobacteria (blue-green algae) blooms. These blooms have occurred in most years since routine lake monitoring began in 1992. Water quality data collected by Thurston County since 1992 shows that Black Lake is eutrophic (high nutrients and algae) due to high phosphorus concentrations. Lake sediments are a primary source of the phosphorus during summer when it is released from iron as anoxic (no oxygen) conditions develop in the bottom waters. The excess phosphorus fuels excess cyanobacteria that float to the surface to form scums and often produce various cyanotoxins (chemicals which are toxic humans, mammals, and waterfowl).

The Black Lake Special District is committed to improving water quality in Black Lake and funded preparation of the Black Lake Phosphorus and Algae Control Plan (Herrera 2015a). That plan identified measures needed to reduce phosphorus inputs to Black Lake and control the production of cyanobacteria and toxic algal blooms, and accomplished the following objectives:

- Developed a water and phosphorus budget to estimate the amount and sources of phosphorus in the lake
- Analyzed the lake sediments to determine the amount of alum (aluminum sulfate used with the buffer sodium aluminate) or Phoslock® (lanthanum treated clay) that would be needed to inactivate sediment phosphorus
- Evaluated alum and Phoslock® treatment methods to control phosphorus sources on both a short-term and long-term basis
- Developed a conceptual plan to control phosphorus (and therefore cyanobacteria) using alum

Water and phosphorus budgets were developed for three study years (2010–2012) using an existing watershed model and lake water quality data. The water budget showed that the primary sources of water flowing into Black Lake on an annual basis are surface inflows (77 percent) and shallow groundwater (14 percent).

The phosphorus budget focused on the summer monitoring period (May through October) when lake data were available for calculating net internal loading from mass balance equations. On average, 60 percent of the total phosphorus loading during the summer months came from net internal loading, 35 percent came from surface inflows, and 5 percent came from shallow groundwater inflow. Because internal loading is a significant source of phosphorus in Black Lake during the summer algae bloom period, a whole lake alum dose was identified as the most appropriate method to inactivate mobile sediment phosphorus. Phoslock® was excluded from consideration due to high cost and poor longevity.

Three alternative alum treatment scenarios were considered; the main differences between the alternatives were related to the timing and dose of the treatment due to uncertainties in

funding, permitting, and contractor availability (see Herrera 2015a). The Spring 2016 Full Treatment Scenario was selected as the preferred scenario because it was the least costly and allowed more time for proper planning, permitting, and funding.

The purpose of this plan is to refine the alum dose and cost estimate, provide additional details about the treatment procedures and timing, and present an alum treatment oversight and water quality monitoring plan that meets permit requirements.

2. PROJECT BACKGROUND

Background information about the Black Lake watershed and lake water quality are presented in the Black Lake Phosphorus and Algae Control Plan (Herrera 2015a), and briefly summarized below for informational purposes.

2.1. Lake Watershed

Black Lake is located in Thurston County, Washington, directly west of Tumwater and 4 miles southwest of Olympia (Figure 2-1). The current outlet of Black Lake is located at the northern end of the lake and flows into Percival Creek, which flows into Capital Lake, located at the mouth of the Deschutes River, and into Budd Inlet in southern Puget Sound. Black Lake is located in the western part of the Deschutes River Water Resources Inventory Area (WRIA) 13). Historically, Black Lake was in the Upper Chehalis River watershed (WRIA 23) because it drained south to the Black River, a tributary to the Chehalis River, as described below.

Black Lake is one of the largest lakes in Thurston County (Thurston County 2012). Black Lake is 2.4 miles long, and has a surface area of approximately 570 acres and a volume of approximately 11,000 acre-feet (Table 2-1). The maximum depth is 30 feet with a mean depth of 19 feet. The lake has approximately 6 miles of shoreline and is located at an altitude of approximately 130 feet mean sea level. Average annual precipitation in Olympia is 49.95 inches with 48 percent occurring in 3 winter months from November through January and only 24 percent occurring during the summer monitoring period from May through October.

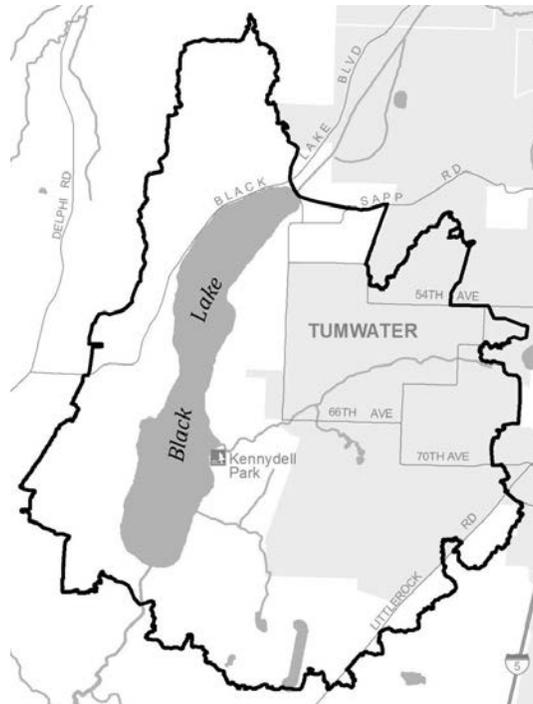
Watershed Area	10.1 square miles (2,616 hectares) ^a
Lake Area	544 to 580 acres (220 to 235 hectares) ^b
Watershed to Lake Area Ratio	11.2 to 11.9 ^b
Lake Length	2.4 miles (9.6 kilometers) ^a
Shoreline Length	6 miles (3.9 kilometers) ^a
Volume	10,408 to 11,259 acre-feet (12.8 to 13.9 million cubic meters) ^b
Maximum Depth	30.1 to 31.6 feet (9.2 to 9.3 meters) ^b
Mean Depth	19.1 to 19.4 feet (5.8 to 5.9 meters) ^b

^a Source: Thurston County 2012.

^b Range for lake surface elevations of 127.5 to 129.0 feet NAVD 1988, representing the typical monthly minimum in the summer to the typical monthly maximum in the winter.



Source: Tetra Tech 2012



Source: Thurston County 2012

Figure 2-1. Black Lake Location Maps.

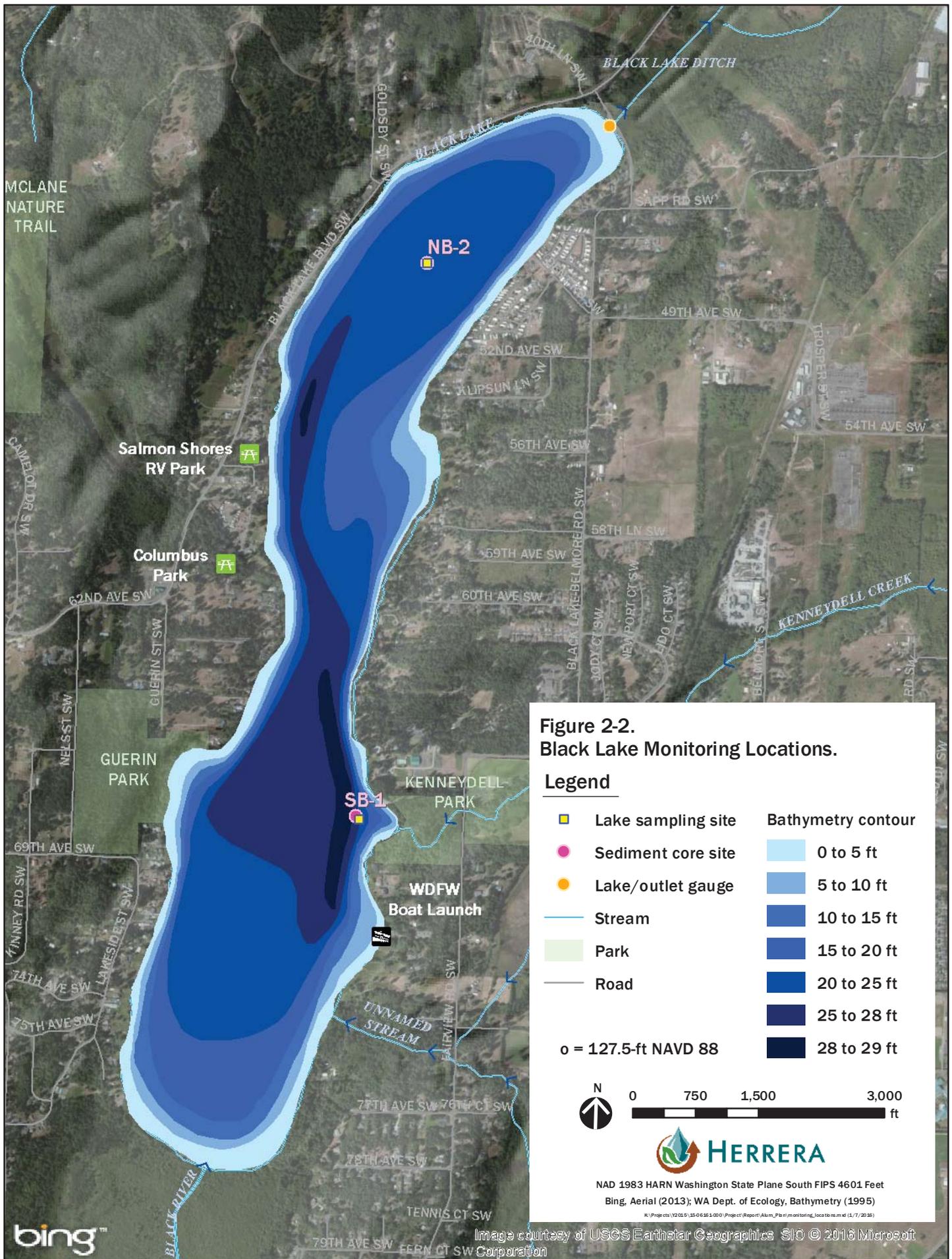
2.2. Lake Water Quality

Thurston County Environmental Health has been consistently monitoring water quality of Black Lake since 1992. Lake monitoring is conducted on a monthly basis during the summer months (May through October) at one site in the deepest point of the lake. This site is located in the south basin adjacent to the Washington Department of Fish and Wildlife (WDFW) public boat launch near Kenneydell County Park (Figure 2-2). Water temperature, dissolved oxygen, pH, and conductivity are measured in profiles at 1-meter depth intervals. Secchi depth is measured with a Secchi disk and water color is recorded. Total phosphorus and total nitrogen are measured in surface water samples collected at a depth of 0.5 meters and bottom water samples are collected approximately 1 meter from the lake bottom. Chlorophyll *a* and phaeophytin *a* (an indicator of degraded chlorophyll) are measured in composite water samples typically from depths of 1, 2, and 3 meters, representing the epilimnion or surface layer of the lake. Selected relevant data are described below.

Black Lake thermally stratifies into an epilimnion (warmer surface layer) and hypolimnion (cooler bottom layer) starting in May. These layers are separated by a thermocline that typically lies at about 15 feet (4.6 meters) from May through July. At this thermocline depth, the hypolimnion covers 83 percent of the lake bottom (see Figure 2-2). The typical seasonal pattern is that the thermocline weakens and deepens in September as air temperatures cool, and the lake completely mixes by the end of October (see Herrera 2015a).

Due to microbial respiration and lack of mixing with the air, dissolved oxygen concentrations are lower below the thermocline. The typical pattern is that the water above the sediments, become anoxic (no oxygen) starting in June and lasting through September and that this anoxic condition spreads throughout the hypolimnion in July and August. Dissolved oxygen concentrations in the epilimnion are typically between 8 and 11 milligrams per liter (mg/L) during the summer months. The low dissolved oxygen concentrations in the hypolimnion (less than 2 mg/L), combined with the high temperatures in the epilimnion, impact habitat for cold water salmonids (trout) in Black Lake where the preferred habitat (i.e., cool water and adequate oxygen) is limited to a small region near the thermocline.

The pH in Black Lake during summer months is typically between 7 (neutral) and 8 in the epilimnion, and at approximately 7 in the hypolimnion. In other eutrophic lakes, algae blooms can drive the pH higher (over 9), which results in increased release of phosphorus from the sediments.



2.2.1. Trophic State Parameters

Lakes are classified into one of four trophic states based on increasing amounts of nutrients and algae: oligotrophic (low nutrients and productivity), mesotrophic (intermediate nutrients and productivity), eutrophic (high nutrients and productivity), and hypereutrophic (very high nutrients and productivity). Carlson’s trophic state index is commonly used to determine the trophic state based on summer (May through October) average values of Secchi depth, chlorophyll *a*, and total phosphorus in the epilimnion (surface layer) of a lake. The trophic state indices and criteria used in the evaluation are compared to ranges observed in Black Lake in Table 2-2.

Trophic Class	Trophic State Index	Secchi Depth (meters) ^a	Chlorophyll <i>a</i> (µg/L) ^a	Total Phosphorus (µg/L) ^a
Oligotrophic	< 40	> 4	< 2.6	< 12
Mesotrophic	40 to 50	2 to 4	2.6 to 7.2	12 to 24
Eutrophic	50 to 60	0.5 to 1	7.2 to 20.1	24 to 48
Hypereutrophic	> 70	< 0.5	> 56	> 96
Black Lake (1992–2014)	45 to 65	1.3 to 2.8	9.7 to 35	21 to 53

^a Summer mean value for epilimnion (Cook et al. 2005).

The summer mean Secchi Depth ranged from 1.3 to 2.8 meters and the overall range was 0.6 to 3.9 meters. The mean Secchi depth results indicate that Black Lake lies between eutrophic and mesotrophic conditions (Table 2-2). There is no apparent long-term trend in Secchi depth (see Herrera 2015a).

The summer mean chlorophyll *a* ranged from 9.7 to 35 µg/L and the overall range among all sample values was 0.5 to 129 µg/L. Thus, mean chlorophyll results are indicative of eutrophic conditions (7.2 to 20.1 µg/L) in Black Lake. There is no apparent long-term trend in chlorophyll concentrations in the epilimnion of Black lake. Chlorophyll *a* and Secchi depth exhibit a moderately strong relationship ($R^2 = 0.61$). This relationship and the relative lack of turbid water inputs to Black Lake suggests that phytoplankton (suspended algae) are the primary factor affecting water transparency in Black Lake.

In the surface water samples, summer means of total phosphorus ranged from 21 to 53 µg/L, while the overall range among samples was 1 to 110 µg/L. Thus, mean total phosphorus concentrations in the surface waters of Black Lake results are typically indicative of eutrophic conditions (24 to 48 µg/L), with concentrations that often exceed the threshold for undesirable algae growth (30 µg/L). In the bottom water samples, summer means ranged from 44 to 304 µg/L, and the overall range among samples was 11 to 624 µg/L. Total phosphorus varied much more in the bottom than the surface, and surface water values are not strongly correlated to bottom water values. There is no apparent long-term trend in phosphorus concentrations in either the surface or bottom waters of Black Lake.

Total phosphorus concentrations in surface water samples (collected at 0.5 meters) are correlated to chlorophyll *a* concentrations in epilimnion samples (collected at 1, 3, and 5 meters) in Figure 2-8. Chlorophyll *a* increases linearly with total phosphorus in a moderately

weak relationship ($R^2 = 0.23$). Thus, total phosphorus is not a very reliable predictor of chlorophyll *a* in Black Lake. This is possibly due to the different sampling depths and variable phosphorus content of different phytoplankton, which can vary by species and growth stage.

The trophic state index (TSI) for each of the three indicator parameters is presented in Figure 2-3. The Secchi and total phosphorus TSI values were typically eutrophic and sometimes mesotrophic. All chlorophyll TSI values were within the eutrophic range within the 23-year period of record. No long-term trends are apparent with either TSI parameter. The consistently higher chlorophyll TSI than the other two indices suggests that phosphorus produces more algae (i.e., that more of the phosphorus is in a bioavailable form) and that algae have less impact on water transparency (i.e., larger particle size) in Black Lake than lakes used to develop the TSI. In combination, these results indicate that the lake is well within the eutrophic range for nutrients and productivity.

2.2.2. Cyanotoxins

Cyanotoxin concentrations in Black Lake algae scum samples indicate that only microcystin concentrations have exceeded state guidelines. Black Lake microcystin concentrations exceeded the recreational guideline of 6 µg/L in all years except 2014. Aphanizomenon and Anabaena appear to be the primary microcystin producers in Black Lake, based on their higher frequency of detection in the scum samples.

2.2.3. Fisheries

Black Lake supports a variety of fish species, making it a popular location for sport fishing (Table 2-4). During the fall and spring, Black Lake is stocked with rainbow trout and supports naturally reproducing coastal cutthroat trout (WDFW 2015). The lake provides diverse habitat for fish, including submersed logs, overhanging and shoreline vegetation and manmade structures such as pilings, docks, and floats.

2.2.4. Recreational and Beneficial Uses

Black Lake supports a variety of beneficial and recreational uses. Protected beneficial uses include swimming, boating, and wildlife habitat (WAC 173-201A). Common recreational uses include waterskiing, jet skiing, and fishing which occur across the waterbody. Public access to Black Lake consists of a Washington Department of Fish and Wildlife (WDFW) public boat launch, Kennedyell County Park (owned by Thurston County), one church camp, two private resorts, and three small private community access points. No known drinking/domestic water or irrigation withdrawals or stock watering sites are known to occur around Black Lake (Thurston County 2012).

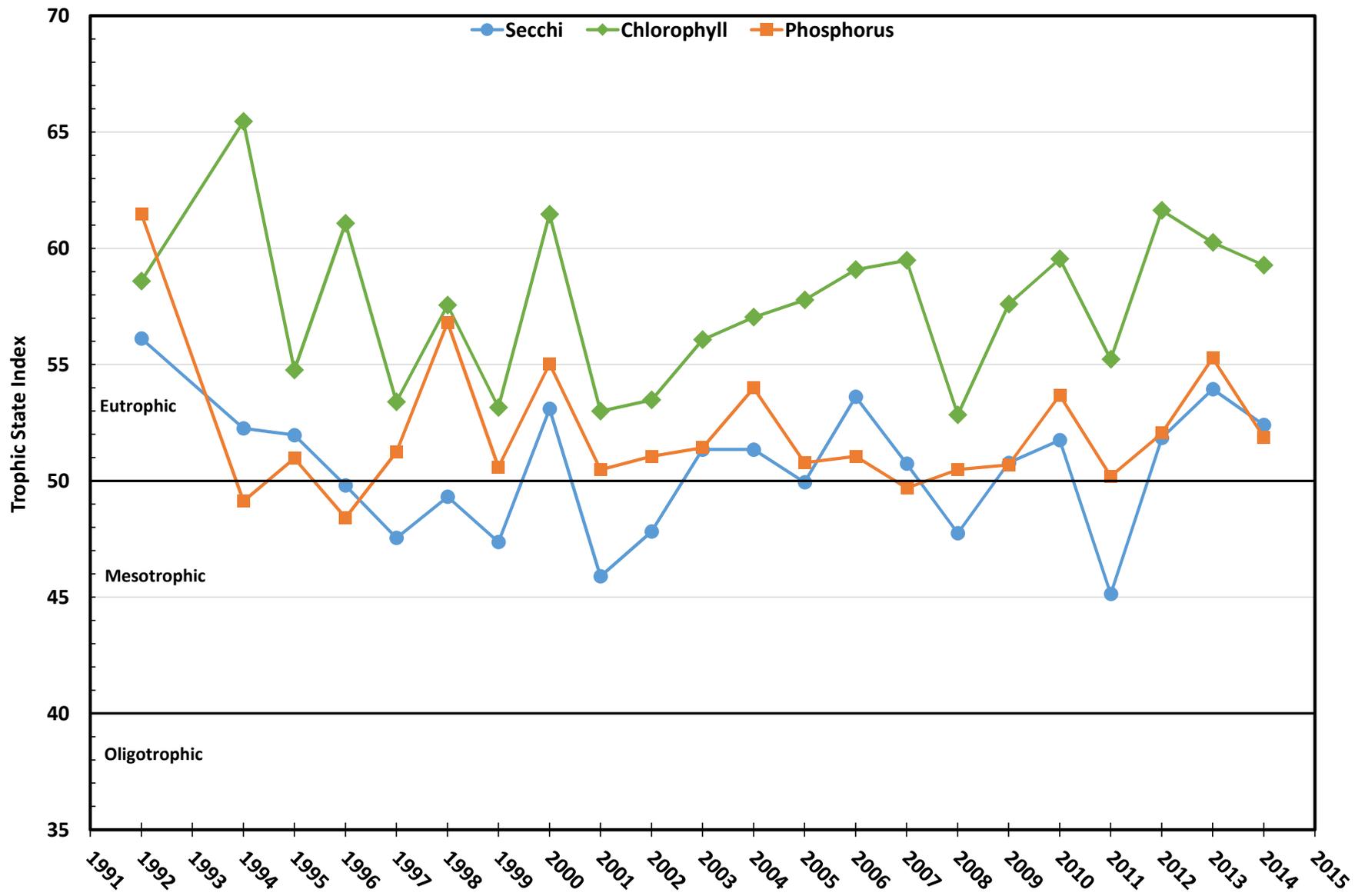


Figure 2-3. Trophic State Indices, Black Lake 1992-2014.

2.3. Sediment Phosphorus

Sediment core analysis of Black Lake was performed to evaluate its potential for contributing to internal phosphorus loading, and then to calculate the dose of alum for sediment phosphorus inactivation. Duplicate sediment cores were collected on March 17, 2015, from each of two locations located in the north basin (station NB-2) and south basin (station SB-1) of the lake (see Figure 2-2), for a total of four sediment cores. The sediment cores were collected in an area with a water depth greater than 4.6 meters (15 feet), to ensure they represented the region that would be considered hypolimnion in the summer. This region represents approximately 83 percent of the lake surface area. The water depth was 23 feet at station NB-1 and 29 feet at station SB-1.

The iron to phosphorus (Fe:P) ratio was high (17 to 57) except for the 5 to 10 cm samples from the north basin (13) and south basin (9). The Fe:P ratio should exceed 10 if it is to regulate phosphorus release and should exceed 15 to prevent phosphorus release from oxidized sediments (Sondergaard et al. 2003). Overall, the Fe:P ratios suggest that phosphorus release would be expected to be low from sediments in the epilimnion (i.e., at water depths less than 15 feet) in Black Lake.

The sediment phosphorus data are presented in Figure 2-4. Results are similar between the two cores; the exception is that aluminum bound phosphorus in the south basin core was 10 to 55 percent higher than the north basin core, which resulted in higher concentrations of total phosphorus in the south basin core. Phosphorus concentrations generally decreased with depth in the sediment cores until reaching relatively stable background concentrations. Stable background concentrations were reached at the 25 to 30 cm interval for aluminum bound phosphorus and at the 15 to 20 cm interval for calcium bound phosphorus, organic phosphorus, and iron bound phosphorus.

Iron bound phosphorus concentrations were very low (24 to 39 mg/kg above 10 cm and 11 to 19 mg/kg below 10 cm) and labile (loosely bound) phosphorus was not detected (less than 2 mg/kg) in any samples. The sum of iron bound and labile phosphorus represents mobile phosphorus that is released from anoxic sediments. Organic phosphorus concentrations were much higher, ranging from 71 to 290 mg/kg. The samples were not analyzed for biogenic phosphorus, which is the fraction of organic phosphorus that is potentially mineralized to labile phosphorus by microbial activity. Biogenic phosphorus was estimated at 163 mg/kg by subtracting the organic phosphorus concentration in the deep sediment samples (non-labile background at 100 mg/kg) from the average organic phosphorus concentration in the shallow sediments (263 mg/kg) (Pilgrim et al. 2007).

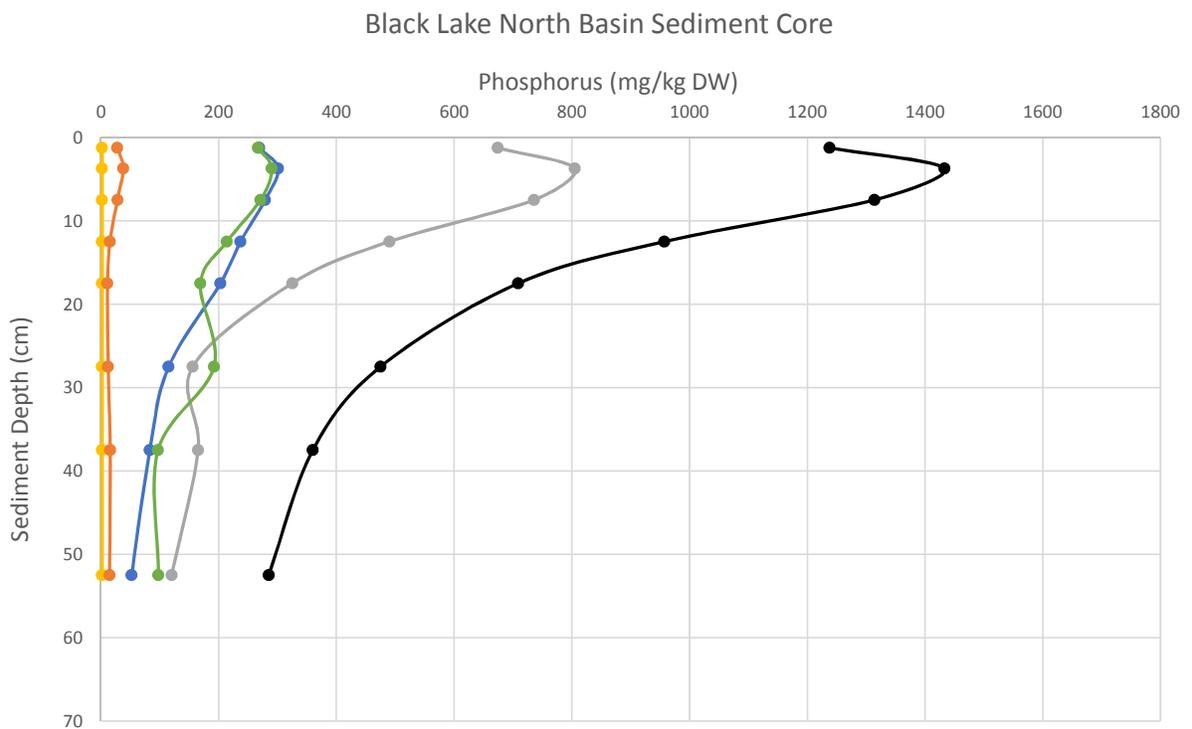
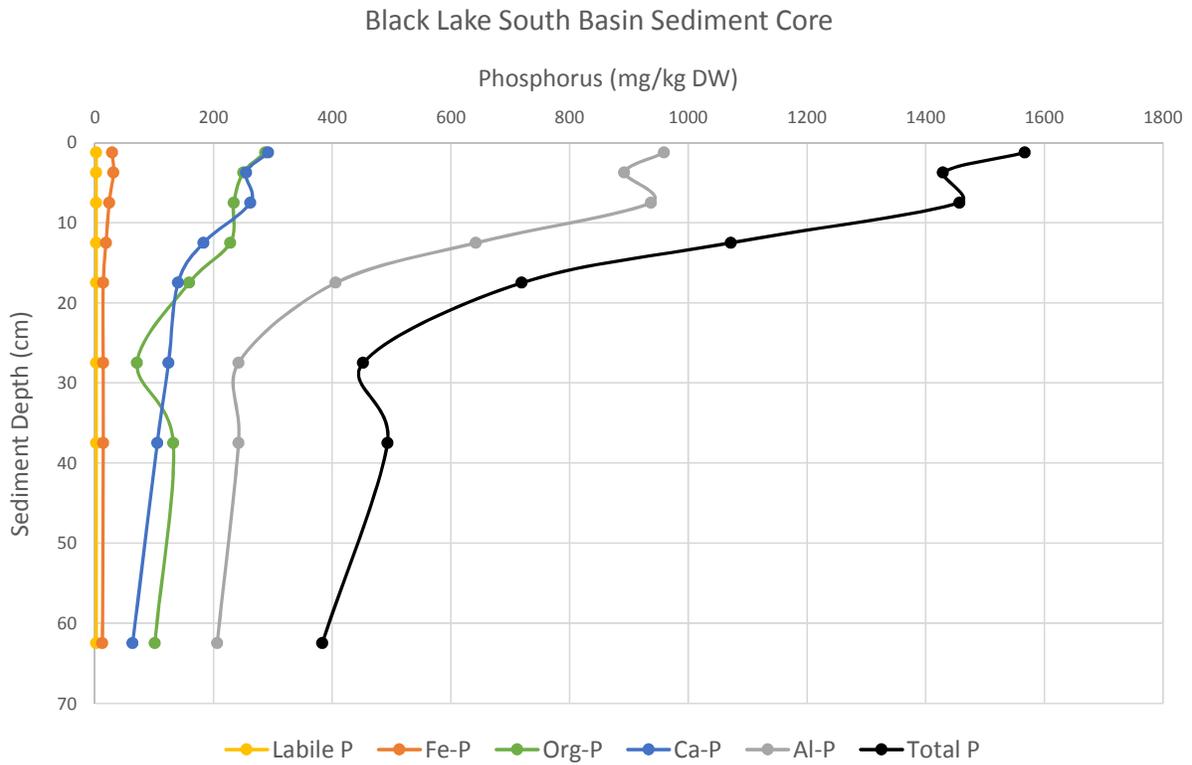


Figure 2-4. Sediment Phosphorus Concentrations in Black Lake, March 2015.

3. ALUM DOSE

3.1. Original Dose

For the Black Lake Phosphorus and Algae Control Plan (Herrera 2015a), the alum dose was calculated as the amount of aluminum required to inactivate sediment phosphorus, and an included a small amount to strip water column phosphorus expected during the treatment (April average). Based on the sediment core results, the dose was designed to bind active phosphorus in the top 10 cm of sediments, which is the phosphorus considered most likely to be released into the water column. Similar to what has been used in other lake treatments, a ratio of 20 parts aluminum to 1 part aluminum bound phosphorus formed was selected in order to effectively bind the active phosphorus.

Active phosphorus in the sediment was calculated using the sum of the labile phosphorus, iron-bound phosphorus, and biogenic phosphorus. Biogenic phosphorus was estimated as the difference between organic phosphorus in the surface (top 10 cm) and subsurface (below 15 cm) sediments to represent the fraction of organic phosphorus that is potentially mineralized by microbial activity. For Black Lake, the average active phosphorus concentration was calculated to be 193 mg P/kg dry weight (DW). A total solids content of 10 percent and a wet bulk density of 1.02 g wet weight/cm³ was used to determine the average areal amount of active phosphorus in the lake at 1.96 g P/m². A maximum hypolimnion area of 1.67 million m² was used based on a minimum thermocline depth of 15 feet and corresponding lake area of 412 acres.

Based on these assumptions, the aluminum dose to inactivate hypolimnetic sediments was calculated to be 65,201 kg Al. An additional 359 kg Al was included to account for the phosphorus present in the water column that would also need to be inactivated. (An aluminum to phosphorus binding ratio of 1 was used for the water column to account for the amount of aluminum added that could bind with phosphorus in the water column instead of the sediments.) The sum of these two doses is 65,560 kg Al. Based on the amount of aluminum present in liquid alum (0.22 kg/gallon) and sodium aluminate (0.56 kg/gallon), and a ratio of 2 parts alum to 1 part sodium aluminate (by volume), a total of 131,119 gallons of alum and 65,560 gallons of sodium aluminate was calculated to achieve the recommended dose.

3.2. Revised Dose

The alum dose initially calculated in the previous study (and summarized above) was revised in consideration of recent developments in alum treatment technology and other factors. The following describes each of the components of the alum dose calculation and provides rationale as to why it was or was not modified:

- **No change in the inactivation depth of 10 cm.** The initial evaluation of the appropriate inactivation depth determined that 10 cm is appropriate for long-term inactivation because mobile phosphorus concentrations substantially decreased below

10 cm in both of the sediment cores. Thus, phosphorus release is expected to be significant where mobile phosphorus is enriched in the upper 10 cm (Pilgrim et al. 2007). In addition, evaluation of alum treated lakes in Washington showed that the aluminum bound phosphorus formed by the treatment was limited to the upper 10 cm of sediment in most lakes (Rydin and Welch 2000).

- **No change in the mobile phosphorus concentration.** The average mobile phosphorus concentration initially used for calculating the aluminum dose was not changed because it was correctly calculated as the depth-weighted average of iron bound and labile phosphorus in the two cores. In addition, the similar concentrations observed in the cores suggest that mobile phosphorus concentrations are relatively uniform throughout the lake area, and that the aluminum dose does not need to vary with depth or location. An average mobile phosphorus concentration of 30 mg/kg in the upper 10 cm of sediment was used to calculate the aluminum dose based on the sum of the average iron phosphorus concentration (29 mg/kg) and labile phosphorus concentration (1 mg/kg, or one-half the detection limit of 2 mg/kg for undetected values in all core samples) (Table 3-1).
- **Reduce biogenic phosphorus concentrations to include only the active fraction.** Initially, the average biogenic phosphorus concentration was estimated to be 163 mg/kg as the difference in average organic phosphorus concentrations in the surface and subsurface sediment samples (see above). For this revision, biogenic phosphorus concentrations were estimated to be 75 percent of the organic phosphorus concentration measured in every core sample. This proportion is based on proportions recently observed on a consistent basis throughout sediment cores collected from Green Lake (64 percent average and 47 to 77 percent range at all stations; Herrera 2015b) and Lake Ketchum (81 percent average and 74 to 86 percent range at the mid-lake station; Snohomish County 2012), and while also recognizing that organic matter production in Black Lake is greater than Green Lake and less than Lake Ketchum. In addition, depth-weighted average subsurface (15 to 40 cm) concentrations of biogenic phosphorus were subtracted from the average surface (0 to 10 cm) concentrations to estimate the active fraction of biogenic phosphorus that will potentially mineralize into mobile phosphorus due to microbial degradation (Pilgrim et al. 2007). An average active biogenic phosphorus concentration of 95 mg/kg in the upper 10 cm of sediment was used to calculate the revised aluminum dose based on the difference in the average biogenic phosphorus concentration of 197 mg/kg and the average organic phosphorus concentration of 263 mg/kg (Table 3-1). The resulting sum of mobile and active biogenic phosphorus targeted for sediment inactivation is 124 mg/kg dry weight.
- **No change in the solids content and bulk density of the targeted sediments.** A total solids content of 10 percent (0.10 g dry weight/g wet weight) was initially measured as the depth-weighted average in the top 10 cm of both cores, and was appropriately used to convert the dry weight to wet weight of targeted phosphorus. A wet bulk density of 1.02 g/cm³ was initially measured in one core sample, and was appropriately used to calculate the mass of targeted phosphorus per unit area of sediment in the top 10 cm. The resulting areal amount of mobile and active biogenic phosphorus is 1.27 g/m².
- **Reduce the ratio of aluminum added to aluminum phosphorus formed.** The ratio of aluminum added to aluminum phosphorus formed was reduced from 20 in the original

calculation (Herrera 2015a) to 10 to account for the addition of active biogenic phosphorus in the targeted amount of sediment phosphorus. A high ratio of 20 has been successfully used in Washington lakes because the targeted amount of sediment phosphorus was based only on the mobile phosphorus concentration. A lower ratio of 8.8 parts aluminum to aluminum phosphorus formed has recently been recommended by European limnologists when active biogenic phosphorus is included in the targeted amount of sediment phosphorus to be inactivated. For this revision, a slightly higher ratio of 10 parts aluminum to targeted sediment phosphorus was used to calculate the amount of aluminum added for the alum treatment and provide an additional safety factor for effectiveness longevity.

- **Expand the treatment area to include the littoral (shallow) sediments between depths of 5 and 15 feet.** The treatment area was increased to include the entire lake bottom below a depth of 5 feet. In the initial estimate only the area located below a depth of 15 feet was included. Originally, the area of sediment above a depth of 15 feet was not included because those waters do not become anoxic and there is sufficient iron to prevent release of mobile phosphorus under those conditions. However, it has been shown in other eutrophic lakes that phosphorus is released from shallow sediments even when the overlying waters do not become anoxic because oxygen is reduced and phosphorus is mineralized by microbial activity (Cooke et al. 2005). The treatment area was expanded from 412 to 509 acres, representing 72 and 89 percent, respectively, of the 570-acre lake. Applying the expanded treatment area to the areal amount of targeted phosphorus (1.27 g/m^2) to the ratio of aluminum added to aluminum phosphorus formed (10) resulted in a total aluminum amount of 26,155 kg to inactivate the targeted sediment phosphorus (Table 3-2).
- **No change in the amount of aluminum added to inactivate water column phosphorus.** The total aluminum amount required to inactivate sediment phosphorus was increased to account for the binding of aluminum to phosphorus present in the water column during the treatment. The initial water column dose was appropriately based on average total phosphorus concentrations observed in the epilimnion and hypolimnion in May (first month of summer monitoring) of 2010-2014, and the average volume of those layers measured in April of 2010-2012. A ratio of 1 part aluminum to aluminum phosphorus formed was appropriately applied to total phosphorus in the water column because total phosphorus includes all forms of phosphorus and additional aluminum is not required to react with additional sources, as for the targeted sediment phosphorus. The additional amount of aluminum required to inactivate water column phosphorus is 359 kg, which amounts to only 1.3 percent of the total aluminum dose of 26,514 kg (sum of 26,155 kg for sediment phosphorus inactivation and 359 kg for water phosphorus inactivation) (Table 3-2).

Table 3-1. Black Lake Sediment Phosphorus Data for Alum Dose Calculation.

Core Location	Depth	Labile P (mg/kg)	Iron P (mg/kg)	Mobile P (mg/kg) ^a	Organic P (mg/kg)	Depth	Mobile P (mg/kg) ^a	Organic P (mg/kg)	Biogenic P (mg/kg)	Active Biogenic P (mg/kg) ^b	Mobile + Active Biogenic P (mg/kg)
	Interval (cm)					Interval (cm)					
South Basin at 29 feet depth	0–2.5	1.0	29.0	30.0	287	0–10	28.1	251	188	98	126
	2.5–5	1.0	31.2	32.2	250						
	5–10	1.0	24.0	25.0	234						
	10–15	1.0	18.7	19.7	228	15–40	15.0	121	91	0.0	15.0
	15–20	1.0	14.0	15.0	159						
	25–30	1.0	13.8	14.8	71.0						
	35–40	1.0	14.1	15.1	132						
60–65	1.0	12.6	13.6	101							
North Basin at 23 feet depth	0–2.5	1.0	27.9	28.9	267	0–10	31.4	275	206	92	123
	2.5–5	1.0	37.8	38.8	290						
	5–10	1.0	28.0	29.0	271						
	10–15	1.0	15.4	16.4	214	15–40	14.0	153	115	0.0	14.0
	15–20	1.0	11.2	12.2	169						
	25–30	1.0	12.3	13.3	192						
	35–40	1.0	15.6	16.6	97.1						
50–55	1.0	14.8	15.8	97.7							
Lake Average						0–10	29.7	263	197	95	124

^a Mobile P = Labile P + Iron P

^b Biogenic P = 75 % of Organic P based on Green Lake (64%) and Lake Ketchum (81%).

^c Active Biogenic P = Biogenic P - Biogenic P from deep sediments (15–40 cm)

Table 3-2. Black Lake Alum Treatment Dose and Cost Estimate for Spring 2016 Sediment Phosphorus Inactivation.

Item	Value	Basis
Sediment Phosphorus		
Mobile P (mg P/kg DW)	30	Depth weighted average of both cores from 0-10 cm for iron-P + 1 for labile-P (<2)
Organic P (mg P/kg DW)	263	Depth weighted average of both cores from 0-10 cm
Active Biogenic P (mg P/kg DW)	95	Biogenic = 75% of Organic P, Active = surface 0-10 cm minus deep 15-40 cm
Mobile+Active P (mg P/kg DW)	124	Sum of mobile and active biogenic P
Total Solids (g DW/g WW)	0.10	Depth weighted average of both cores from 0-10 cm
Wet Bulk Density (g WW/cm ³)	1.02	Maximum for 0-10 equal to sample NB-25-30 lab result
Inactivation Depth (cm)	10	Based on mobile+active P profile and observed in alum-treated Washington lakes
Mobile+Active P areal amount (g P/m ²)	1.27	Mobile-P x total solids x density x depth x 10 ⁻³ kg DW/g DW x 10 ⁻³ g P/mg P x 10 ⁴ cm ² /m ²
Al-P binding ratio	10	Excess Al to inactivate migrated and mineralized sediment P (recent research in Europe)
Treatment area (m ²)	2,059,923	Lake area > 5 feet depth = 509 acres x 4047 m ² /acre
Treatment dose (kg Al)	26,155	Mobile-P x Al-P ratio x area x 10 ⁻³ kg/g
Water Phosphorus		
		April Application
Epilimnion TP (ug/L = mg/m ³)	16	May 2010-2014 mean
Epilimnion Volume (m ³)	9,820,000	April whole lake - hypo volume at 15 ft (13.70-3.88 x 10 ⁶ m ³)
Hypolimnion TP (ug/L = mg/m ³)	52	May 2010-2014 mean
Hypolimnion Volume (m ³)	3,880,000	Hypolimnion volume (3.88x10 ⁶ m ³)
Total water phosphorus amount (kg)	359	(Epi TPxVol + Hypo TPxVol) x 10 ⁻⁶ kg/mg
AL-P binding ratio	1	No excess Al needed for TP in water
Water dose (kg Al)	359	
Aluminum Dose		
Total Al dose (kg Al)	26,514	Sum of sediment and water Al dose
Al volumetric dose (mg Al/L)	1.9	Total dose/lake volume in kg/m ³ x 10 ³ L/m ³
Al areal dose (g Al/m ²)	12.9	Total dose/treatment area in kg/m ² x 10 ³ g/kg
Material Amounts		
Al sediment+water dose (kg Al)	26,514	Sum of sediment and water Al dose
Al in Alum (kg Al)	11,784	2:1 liguid = 0.44:0.55 weight ratio; Alum at 4.4% soluble Al and SG of 1.337 g/mL
Al in Sodium aluminate (kg Al)	14,730	2:1 liguid = 0.44:0.55 weight ratio; Aluminate at 32% and SG of 1.40 g/mL
Alum volume (gal)	53,563	0.22 kg Al/gal; round to 53,560 = 12 trucks at 4,500 gal/truck
Sodium aluminate volume (gal)	26,781	0.55 kg Al/gal; round to 26,780 = 6 trucks at 4,500 gal/truck

The revised aluminum dose is 1.9 mg Al/L on a volumetric basis and 12.9 g Al/m² on an areal basis (Table 3-2). This dose is approximately 40 percent of the original dose of 4.8 mg Al/L on a volumetric basis and 39 g Al/m² on an areal basis (Herrera 2015a).

Based on the amount of aluminum present in liquid alum (0.22 kg/gallon) and sodium aluminate (0.55 kg/gallon), and a ratio of 2 parts alum to 1 part sodium aluminate (by volume), a total of 53,560 gallons of alum and 26,780 gallons of sodium aluminate will be applied to Black Lake. Based on a truck capacity of 4,500 gallons, a total of 12 trucks will be required for the alum and 6 trucks for the sodium aluminate. It is expected to take 3 to 4 days to apply these materials.

3.3. Comparison to Other Lakes

The revised aluminum dose for Black Lake (12.9 g Al/m²) is lower than doses applied to other lakes treated since 2004 when the sediment phosphorus method was first used in Washington State (Table 3.3). Recently treated lakes with higher areal doses include Green Lake in King County (94 g Al/m² in 2004 and 32 g Al/m² planned for 2016), Long Lake in Kitsap County (41 g Al/m²) in 2006 and 2007, Long Lake in Thurston County (55 g Al/m² in 2008), and Lake Ketchum in Snohomish County (66 g Al/m² in each of 2014 and 2015). These lakes received higher doses because they had higher mobile phosphorus concentrations, or the doses were based on deeper inactivation depths or higher ratios of aluminum to aluminum phosphorus formed. The revised areal dose for Black Lake exceeds amounts applied to other lakes in western Washington from 1980 to 1995 (6 to 12 g Al/m²) when the alum dose was calculated using an entirely different method based on jar tests of alum effects on lake pH.

Lake (County)	Treatment Date	Volumetric Dose (mg Al/L)	Areal Dose (g Al/m ²)	Longevity (years) ^a	Reference
Black Lake (Thurston)	2016 (planned)	1.9	12.9	unknown	–
Lake Ketchum (Snohomish)	May 2014 March 2015	19 19	66.5 66.5	NA unknown	G. Williams (pers. comm.)
Long Lake (Thurston)	September 1983 2008 (planned)	7.7 15.2	27.8 54.9	5 unknown	Welch/Cooke 1999 Tetra Tech 2006
Long Lake (Kitsap)	September 1980 September 1991 August 2006 April 2007	5.5 5.5 2.5 17.5	10.7 10.7 4.6 36.2	> 11 > 11 NA > 5	Rydin and Welch 2000 Rydin and Welch 2000 Tetra Tech 2010 Tetra Tech 2010
Green Lake (King)	October 1991 April 2004 2016 (planned)	8.6 24 8.2	34 94 32	3 > 10 unknown	Herrera 2003 Herrera 2004 Herrera 2015b
Phantom Lake (King)	September 1990	4.2	9.5	unknown	Rydin and Welch 2000
Lake Ballinger (King)	June 1990	5.0	6.5	unknown	Rydin and Welch 2000
Lake Campbell (Skagit)	October 1985	10.9	12.2	> 8	Rydin and Welch 2000
Lake Erie (Skagit)	September 1985	10.9	5.7	> 8	Rydin and Welch 2000
Medical Lake (Spokane)	Aug.-Sept. 1977	12.2	83.5	unknown	Rydin and Welch 2000

^a Cooke et al. 2005 except Herrera 2015b for Green Lake.

Cooke (et al. 2005) assessed the longevity of several alum treatments in western Washington and those treatments lasting at least 5 years were considered to be successful. Each of the successful treatments applied less aluminum than the planned dose for Black Lake. These successful treatments were for lakes located in relatively undeveloped watersheds like Black Lake, and included Long Lake in Kitsap County in 1980 and 1991, and Lake Campbell and Lake Erie in 1985 (see Table 7-1). This comparison suggests that the Black Lake alum treatment will last at least 5 years. The treatment may prevent toxic cyanobacteria blooms for up to 10 years if the added aluminum continues to react with mineralized biogenic phosphorus and inputs of watershed phosphorus, as was recently discovered to have occurred following the 2004 alum treatment of Green Lake (Herrera 2015b).

4. ALUM TREATMENT

Chemical materials and the application procedures have been designed as described below for the revised dose to achieve maximum effectiveness with protection of fish and other aquatic organisms. Technical specifications have been prepared separately based on this final design for advertisement and procurement of an experienced contractor to perform the alum treatment. The technical specifications include additional details on the materials and application procedures to ensure proper handling, dosing, floc formation, and distribution of the materials in the lake.

The technical specifications also include requirements for public notification and equipment calibration and maintenance that are specified in the Aquatic Plant and Algae Management Permit (Permit) issued the Washington Department of Ecology (Ecology 2015). The Permit also requires water quality monitoring and reporting that is described in Section 5 below. The Permit is currently a draft that is expected to be finalized before the treatment begins, without any substantial changes to alum applications.

4.1. Chemical Materials

The Contractor will apply liquid aluminum sulfate (alum) and liquid sodium aluminate (buffer) simultaneously at a volumetric ratio of 2:1 (alum: sodium aluminate) for phosphorus control in Blake Lake. A ratio of 2:1 will provide 0.44 kg Al from 2 gallons of liquid alum and 0.55 kg Al from 1 gallon of liquid sodium aluminate, given a concentration of 4.2 percent of total water-soluble aluminum in the alum, and of 32 percent of available soluble sodium aluminate in the buffer. The application ratio of alum and sodium aluminate will need to be modified and quantities of sodium aluminate revised if concentrations differ and depending on results of jar tests conducted immediately prior to treatment (see Section 5).

The alum and sodium aluminate will be drinking water treatment grade as specified by the National Sanitation Foundation (NSF), and will contain no substances in quantities capable of producing deleterious or injurious effects on public health or water quality.

4.2. Preparation

The Contractor will protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, or other hazards created by the transport and delivery of chemicals, chemical storage tanks, and chemical spills. During and at the completion of the application of liquid alum and sodium aluminate, the Contractor will conduct all operations in such a way as to:

- Comply with any and all permit conditions for this project.
- Prevent damage to the lake, equipment, and surrounding properties.
- Prevent damage to the aquatic environment from hydraulic fluid leaks by using a biodegradable hydraulic fluid in all equipment.

- Prevent damage to the lake by ensuring that no aquatic invasive species are introduced into the lake. This shall include decontaminating all equipment and gear that will come into contact with lake water prior to bringing such equipment to the staging area.
- Maintain orderly appearance at the staging area and on the treatment vessel while the treatment is occurring.
- Prevent damage to the aquatic environment if temporary on-shore storage tanks are used at the staging area.
- Prevent damage to all utilities and below ground infrastructure at the staging area.

4.3. Equipment Staging and Chemical Storage

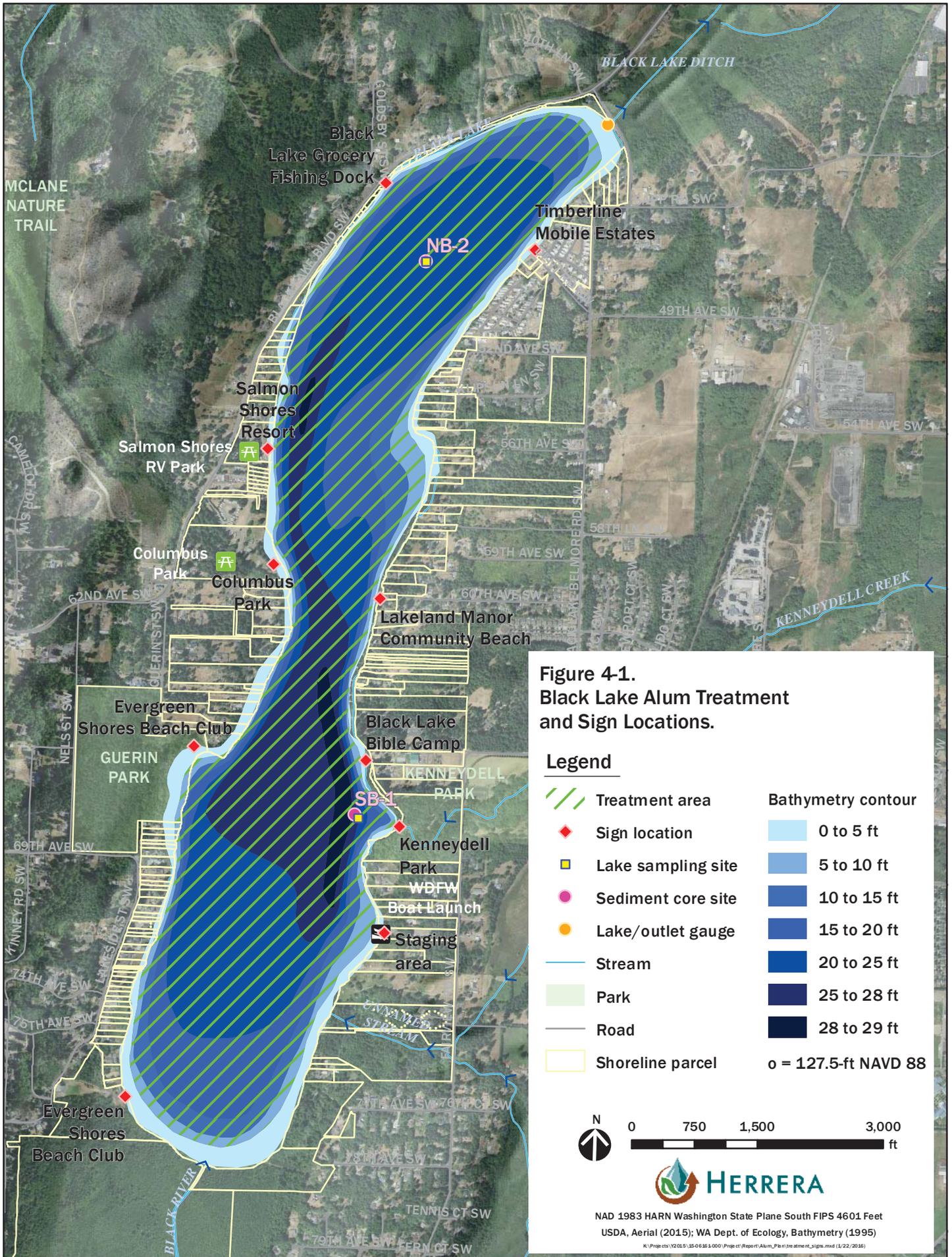
The use of temporary, on-shore storage tanks for staging the chemicals is recommended, but not required, to ensure that the application of alum and sodium aluminate is successfully completed in the required applications time frame of 3 working days. On-shore storage tanks are not required if the rate of application can keep pace with delivery of chemicals. On-shore and on-board chemical storage tanks and associated spill containment equipment that meet local state and federal regulations, including those specified by the Washington State Department of Fish and Wildlife (WDFW) for use of the WDFW boat launch for the staging area see Section 4.5).

If on-shore storage tanks are used, separate tanks shall be provided for each chemical. All on-shore storage tanks shall be fabricated out of HDPE or other suitable material (i.e., stainless steel) that is tolerant of temperature in excess of 200 degrees Fahrenheit.

4.4. Chemical Application

The alum and sodium aluminate application shall occur between April 11 and April 29, 2016. Although there are no use restrictions during the treatment, this schedule was selected to perform the treatment to minimize potential interference with periods of high recreational use that are anticipated to occur during spring break for local schools before the period and the Black Lake Fishing Derby after the treatment. The application will be completed within 4 consecutive weekdays, with 2 additional days for mobilization and another additional 2 days for demobilization.

The area of the lake within the 5-foot depth contour (509 acres or 206 hectares) will be treated at 12.9 mg Al/m² (Figure 4-1). Application of the alum and sodium aluminate will take place after the lake water temperature has risen to over 5.5°C (42° F) throughout the first 4 meters of the water column, which will occur by April 11, 2016. Application will take place only when the wind speed is less than or equal to 15 mph at the lake surface, as required by the permit.



A mixture of liquid aluminum sulfate (alum) and liquid sodium aluminate (buffer) will be injected below the lake surface from a moving vessel (barge or boat). The alum and sodium aluminate should not come in contact with one another outside of the water. The treatment vessel position in the lake will be controlled by a global positioning system (GPS) to continuously adjust the application rate of liquid alum and sodium aluminate mixture (2 gallons alum to 1 gallon sodium aluminate, assuming 32 percent soluble sodium aluminate concentration) based on boat speed. This will ensure complete and uniform chemical coverage during application.

The treatment vessel will have sonar equipment to record water depth, but this equipment does not need to be integrated with the GPS system because the treatment rate will not vary with water depth.

The treatment vessel will contain chemical storage tanks with secondary containment, and applicator equipment for even chemical distribution. The system of chemical distribution will have a minimum application rate of 20,000 gallons per day of combined alum and sodium aluminate. The chemicals will be delivered to the lake water from a boom system at an approximate depth of 1 to 2 inches below the water surface from a minimum of 12 pairs, up to a maximum of 24 pairs, of alum and sodium aluminate injection tubes (nozzles or small hoses) spaced 8 to 12 inches between pairs and with the alum and sodium aluminate injection tubes within each pair spaced 2 to 4 inches apart. The injection tubes will be alternating so that the closest tubes in each direction are always tubes of the other chemical. The treatment will not begin until the boom system is approved on-site by the Resident Engineer (see Section 5).

In accordance with the Ecology permit, the lake pH, and if needed, alkalinity will be monitored in surface water samples by the District representative (Herrera) as described in Section 5. Work will be suspended if the pH of lake water is consistently less than 6.0 (± 0.05) or greater than 8.7 (± 0.05) in the collected water samples. The threshold for re-starting treatment will be a pH between 6.2 and 8.4 (± 0.05) and an alkalinity of at least 12 mg/L (± 0.5 mg/L). Prior to beginning the lake alum treatment (0.5 to 48 hours before), the District representative will also conduct a jar test at the lake in a bucket or barrel using alum and sodium aluminate at 1.9 mg Al/L to verify that treated water is above pH 6.0 after addition and mixing (0.25 to 0.5 hours after being dosed).

4.5. Permit Requirements

The alum treatment will be conducted in accordance with Ecology's Aquatic Plant and Algae Management General Permit (Ecology 2015). This permit is currently being revised and the draft permit does not include any revisions to restrictions for alum treatments. A notice of intent (permit application) was submitted to Ecology on behalf of the District on November 20, 2015. The 30-day public comment period began on December 2, 2015, which coincides with the second notice was published in the newspaper. The notice was published in The Daily Olympian on November 25 and December 2, 2015. Ecology anticipates authorization of the treatment by January 31, 2016.

4.5.1. *Permit Restrictions*

Permit restrictions for alum treatments (see Table 4 in Ecology 2015) include:

- Timing restrictions:
 - None for fish or other priority species.
 - Early spring or fall treatment if aquatic plant biomass interferes with inactivation of sediment phosphorus.
- Lake use restrictions or advisories:
 - None.
- Treatment restrictions:
 - Application must cease when wind speed is greater than 15 miles per hour.
 - Powdered alum must be mixed with water to form a slurry before applying to the water surface.
 - The pH of lake water during treatment must remain between 6.0 and 8.5 based on lake average.
 - Only aluminum compounds suitable for water treatment may be used.
 - Buffering materials must be available for use.
- Monitoring requirements:
 - Minimum monitoring is one surface water pH measurement in the morning prior to any alum addition and one surface water pH measurement 1 hour after alum addition has stopped for that day.
 - Monitoring for pH must continue for the duration of the treatment and for 24 hours following treatment completion.
 - Monitoring locations must be representative of water body-wide conditions.
- Other restrictions:
 - A jar test must be completed prior to whole lake treatments only if a buffer other than sodium aluminate is used or a ratio of liquid alum to liquid sodium aluminate differs from 2:1 by volume.
 - An on-site storage facility is required for any treatment requiring 9,000 gallons of alum or more, or the project proponent must have a plan to store any unused alum or buffering products.

The general permit allows for short- and long-term exceedance of Washington State Surface Water Quality Standards (WAC 173-201A) provided that the Permittee complies with any short-term modifications of water quality criteria authorized in writing by Ecology. Water quality degradation is allowed if the degradation does not significantly interfere with or become injurious to existing or designated water uses or cause long-term harm to the environment (WAC 173-201A-410).

4.5.2. Ecology Notification

The District representative (Herrera) will email pre- and post-treatment information to Ecology as required by the permit. The District representative (Herrera) and will coordinate and schedule inspections by Ecology, and will immediately call Ecology if the following conditions occur during or after the treatment:

- Any person(s) exhibiting or indicating any toxic and/or allergic response as a result of the treatment
- Any fish or fauna exhibiting stress or dying inside or outside of the treatment area
- Any spill of chemicals covered under this permit that occurs into the water or onto land with a potential for entry into waters of the state.

4.5.3. Public Notification and Sign Posting

The District will notify residents, businesses, and shoreline recreational facilities at least 10 days in advance and at most 42 days before the first day of treatment in accordance with permit requirements, and will provide Ecology and the Washington Department of Natural Resources a copy of the notice.

The Contractor will provide and install all required shoreline and public access notification signs per the posting requirements of the Ecology permit. General signage requirements will include the following:

- Use the template provided in the permit.
- Post signs no more than 48 hours prior to treatment.
- Post signs so that they are secure from the normal effects of weather and water currents, but cause minimal damage to property.
- Make best efforts to ensure that the signs remain in place and are legible until removed.
- Remove all signs between 2 and 10 days after the treatment ends.

Posting shoreline public access areas with 2- by 3-foot signs will include:

- The Contractor will post 2- by 3-foot signs at all public access areas that include a total of 10 locations shown in Figure 4-1.
- The Contractor will post the signs to face both the water and the shore and site them on the shore side of the pathway where they are visible to pathway users and do not obstruct pathway use.
- Signs must be a minimum size of 2- by 3-foot and constructed of durable weather-resistant material.

- The Contractor will attach an 8.5- by 11-inch weather resistant map of the lake to each sign designating the following:
 - “Treatment area includes the entire lake area below a depth of 5 feet for both chemicals” (located within the lake area)
 - Mark and label the “Start and Stop Address: WDFW Boat Launch, Latitude 46.9830314, Longitude -122.9731335
 - Mark and label the “Reader’s Location”
- Signs must include the word “CAUTION” in bold black type at least 2 inches high, and use a font at least 0.5 inches high for all other words.

Posting privately-owned and publicly-owned shoreline properties (excluding public access areas) with 8.5- by 11-inch signs will include:

- The Contractor will post 8.5- by 11-inch signs at every waterfront residence or business.
- The Contractor will post the signs to face both the water and the shore and site them on the shore side of the pathway where they are visible to pathway users and do not obstruct pathway use.
- Signs must be a minimum size of 8.5- by 11-inch and protected from constructed of durable weather-resistant material.

5. TREATMENT OVERSIGHT AND MONITORING

5.1. Treatment Oversight

Herrera will assist the Black Lake Special District with the selection of an experienced contractor to perform the alum treatment. The alum treatment will be observed by a qualified Resident Engineer from Herrera during each day of treatment to record material quantities, observe application procedures, and modify application procedures if needed. Construction inspection forms with a summary of observations and monitoring results should be prepared on a daily basis. These forms will be presented in a treatment monitoring report (see Section 5.2) with additional documentation provided by the contractor. The Resident Engineer will obtain and review water quality data provided by a qualified Water Quality Monitor from Herrera on a regular basis. The treatment application will be terminated or modified as necessary to meet the technical specifications and water quality requirements specified in Section 5.

5.2. Water Quality Objectives

The Black Lake water quality data and phosphorus budget clearly show that internal phosphorus loading from lake sediments is the primary source of phosphorus used by cyanobacteria, and that control of internal phosphorus loading is needed to reduce the amount of phosphorus available to cyanobacteria in the lake during the summer growing season (Herrera 2015a). Net internal phosphorus loading to the lake varied greatly among the 3 study years, but consistently represented 60 percent (± 2 percent) of the total phosphorus loadings to the lake during the summer months (May through October).

Treatment goals and water quality objectives must be established to evaluate treatment effectiveness. The overall treatment goal for Black Lake is to prevent cyanobacteria blooms and lake closures for at least 5 years. Although it is not possible to reliably estimate the amount of phosphorus reduction needed to meet this goal, it is reasonable to establish treatment objectives based on lake trophic status. A reasonable objective for Black Lake is to decrease the trophic state from eutrophic to mesotrophic. Specific objectives for each trophic state parameter are compared to the recent lake status in Table 6-1.

Parameter	Treatment Objective	Five-Year Status (2010–2014)	
		Mean	Range
Trophic Class	Mesotrophic	Eutrophic	Meso-Eutrophic
Trophic State Index	< 50	54	50 to 56
Secchi Depth (meters)	> 2	1.9	1.5 to 2.8
Chlorophyll <i>a</i> ($\mu\text{g/L}$)	< 7.2	18.9	12.4 to 23.7
Total Phosphorus ($\mu\text{g/L}$)	< 24	29.0	24.3 to 34.6

To meet the treatment goal, the alum treatment is designed to significantly reduce internal phosphorus loading for at least 5 years. Successful treatments reduced internal loading by approximately 70 percent for at least 5 years (Cooke et al. 2005). Based on the phosphorus budget estimate of internal loading accounting for 60 percent total summer phosphorus input, a 70 percent reduction of internal loading in Black Lake would result in a 40 percent reduction in the total summer phosphorus input (70 percent reduction of 60 percent of the input). An equivalent reduction in summer mean phosphorus concentrations over the past 5 years, ranging from 24 to 35 µg/L (see Table 7-2), equates to post-treatment summer mean phosphorus concentrations ranging from 14 to 21 µg/L. This range is well below the treatment objective for total phosphorus at less than 24 µg/L (eutrophic threshold). A change in trophic status from eutrophic to mesotrophic is likely to reduce the amount and frequency of cyanobacteria blooms.

The chlorophyll objective will be more difficult to meet than the phosphorus objective because of the high chlorophyll to phosphorus ratio in Black Lake. Based on the phosphorus-chlorophyll relationship observed in Black Lake (see Figure 2-8), the 5-year summer mean chlorophyll *a* concentrations are predicted to be reduced from 12 to 24 µg/L to 11 to 14 µg/L. Thus, the predicted phosphorus reduction would not be sufficient to meet the treatment objective for chlorophyll *a* at less than 7.2 µg/L. While the treatment objectives are reasonable, predictions for meeting the objectives are not reliable given the weak relationships among trophic state parameters, potential changes in those relationships due to changes in the algal composition, and the unknown relationships between summer mean values and peak values observed during cyanobacteria blooms.

5.3. Water Quality Monitoring

Water quality monitoring will consist of jar tests, treatment monitoring, and post-treatment monitoring. A detailed water quality monitoring plan is presented in Appendix A.

5.3.1. Jar Test

Jar tests will be conducted on the first day of alum treatment. This testing will be performed for pH using the alum treatment chemicals, dose, and application method provided by the treatment contractor using water and water quality conditions present at the time of application. This large-scale jar test will be performed at the alum treatment staging area located at the WDFW boat launch on the east shore of Black Lake (see Figure 2-2).

A testing vessel (e.g., 5-gallon plastic bucket) will be filled with lake water and treated with aluminum sulfate and sodium aluminate directly taken from the supply trucks or storage tanks. As described in the monitoring plan, the jar test will be conducted using three ratios (1.9:1, 2.0:1, and 2.1:1) of alum and sodium aluminate to ensure correct buffering under current treatment conditions. A control bucket with only lake water will also be tested.

The pH of the collected lake water will be tested immediately before treatment and after 2 minutes, 15 minutes, 30 minutes, and 1 hour after dosing. Monitoring results will be recorded and immediately reported to the Resident Engineer.

5.3.2. Treatment Monitoring

For planning purposes, it is assumed that the treatment monitoring will be conducted over a 19-day period from April 11 through April 29, which will include the application of alum during up to 4 consecutive days.

Treatment monitoring will include the following three elements:

- Monitoring before and after the alum addition to evaluate short-term impacts of the treatment on various water quality parameters at established monitoring stations.
- Twice-daily monitoring (in the morning before treatment begins and in the afternoon or evening when treatment ends) to verify that pH criteria (between 6.0 and 8.7) and alkalinity criteria (greater than 12 mg/L) are met at established monitoring stations.
- Random monitoring of pH during the alum application at treatment sites will be conducted at least once every 2 hours at specific treatment locations and allowing for 1 hour of alum settling.

Short-term impact monitoring will consist of measuring field parameters, and collecting water samples from 1 meter below the water surface and 1 meter above the lake bottom at the south and north basin monitoring stations (see Figure 2-2). A total of four water samples will be collected from the lake on three occasions: 1) the day before the first day of treatment, 2) two days following the last day of treatment, and 3) two weeks following the last day of treatment. The collected samples will be analyzed for the following parameters:

- Secchi depth (field measurement)
- Temperature (field measurement at 1-meter intervals)
- Dissolved oxygen (field measurement at 1-meter intervals)
- pH (field measurement at 1-meter intervals)
- Conductivity (field measurement at 1-meter intervals)
- Total alkalinity
- Dissolved aluminum
- Total recoverable aluminum
- Sulfate
- Soluble reactive phosphorus
- Total phosphorus
- Chlorophyll *a*

Twice-daily monitoring will consist of measuring field parameters at the south and north basin stations (see Figure 2-2) in the morning before treatment begins, and in the afternoon or evening when treatment ends. The field parameters include Secchi depth and vertical profiles of temperature, dissolved oxygen, pH, and conductivity at 1-meter intervals. In addition, total alkalinity will be tested in the field on water samples collected from 1 meter below the

water surface and 1 meter above the lake bottom at each station. If the pH is consistently less than 6.0 at a monitoring station, then the samples collected from that station will be analyzed for dissolved and total aluminum.

Random daily monitoring will consist of measuring pH at the treatment site during the alum application at a frequency of at least once every 2 hours. The pH will be measured at 1-meter intervals at the location where alum was applied approximately 1 hour before the time of sample collection. The 1 hour delay in sampling will allow for settling of the alum floc and stabilization of water quality conditions. If the pH is consistently less than 6.0 at a treatment site, then samples will be collected from 1 meter below the water surface and 1 meter above the lake bottom, and analyzed in the field for total alkalinity.

The alum treatment will be suspended if the pH is consistently less than 6.0 (± 0.05) or greater than 8.7 (± 0.05) in samples collected at the treatment sites or at the twice-daily monitoring stations. Additional monitoring will be conducted as necessary to determine when the lake pH and alkalinity have adequately recovered. Treatment may resume if the pH is between 6.2 and 8.4 (± 0.05) and the alkalinity is greater than 12 mg/L (± 0.5 mg/L) at all monitoring locations.

Observations of the alum treatment activities, floc formation, and potential fish and wildlife impacts will be made during random daily monitoring. All data and observations will be recorded and reported in the treatment monitoring report (Section 5.4).

In the event of a spill or treatment monitoring data that do not comply with the permit conditions, Ecology's Southwest Regional Office will be notified immediately. Pretreatment and post-treatment notification will be submitted to Ecology on a weekly basis as required by the permit. In addition, observations of fish or wildlife impacts will be immediately reported to Ecology and the Region 6 (Coastal) office of the Washington Department of Fish and Wildlife.

5.3.3. Post-Treatment Monitoring

It is anticipated that long-term water quality monitoring will be conducted for at least 5 years after the alum treatment has been completed. The objective of post-treatment monitoring will be to evaluate whether the alum treatment objectives for Black Lake are being met. Post-treatment monitoring will be conducted by Thurston County Environmental Health according to methods used historically to assess lake conditions and public health. Lake monitoring will occur once each month from May through October. Water samples will be collected near the lake surface and bottom at the south basin station for analysis of the following:

- Secchi depth (field measurement)
- Temperature, dissolved oxygen, pH, and conductivity profiles (field measurement)
- Total phosphorus and total nitrogen (laboratory analysis)
- Chlorophyll *a* (laboratory analysis)

If a cyanobacteria bloom is observed in Black Lake, Thurston County will collect scum samples from the lake for analysis of cyanotoxins and identification of phytoplankton species present in samples.

5.4. Reporting

Herrera will prepare a treatment report summarizing all observations and data collected for treatment oversight and water quality monitoring. Water quality monitoring results will include jar tests and treatment monitoring in spring 2016, and the first year of post-treatment monitoring in summer 2016. Field and laboratory results will be tabulated in spreadsheets that include associated data qualifiers for estimated values, rejected values, and values exceeding established thresholds, objectives, or water quality criteria. Data quality assurance reports should be prepared that summarize the following information:

- Changes in the monitoring plan
- Significant quality assurance problems and corrective actions
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability, and detection limits
- Discussion of whether the quality assurance objectives were met, and the resulting impact on decision-making
- Limitations on use of the measurement data.

The monitoring report will describe the treatment oversight and monitoring methods, present data tables, and discuss the monitoring results. Treatment monitoring results will be compared to the permit requirements and the short-term water quality impact of the alum treatment will be discussed. Post-treatment monitoring values will be evaluated by comparison with historical data and treatment objectives. Thurston County will report water quality conditions beyond the first year of post-treatment monitoring.

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APPENDIX A

Water Quality Monitoring Plan

WATER QUALITY MONITORING PLAN

BLACK LAKE ALUM TREATMENT

Prepared for
Black Lake Special District

Prepared by
Herrera Environmental Consultants, Inc.



Note:

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

WATER QUALITY MONITORING PLAN

BLACK LAKE ALUM TREATMENT

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January 22, 2016

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1. INTRODUCTION

Black Lake, located in Olympia, Washington, has high nutrient levels that result in cyanobacteria (blue-green algae) blooms. These blooms have occurred in most years since routine lake monitoring began in 1992. Water quality data collected by Thurston County since 1992 shows that Black Lake is eutrophic (high nutrients and algae) due to high phosphorus concentrations. Lake sediments are a primary source of the phosphorus during summer when it is released from iron as anoxic (no oxygen) conditions develop in the bottom waters. The excess phosphorus fuels excess cyanobacteria that float to the surface to form scums and often produce various cyanotoxins (chemicals which are toxic to humans, mammals, and waterfowl).

The Black Lake Special District is committed to improving water quality in Black Lake and funded preparation of the Black Lake Phosphorus and Algae Control Plan (Herrera 2015) to identify the measures needed to reduce phosphorus inputs to Black Lake. A water budget and phosphorus budget were developed for three study years (2010–2012) using an existing watershed model and lake water quality data. The water budget indicates that the primary sources of water flowing into Black Lake are surface inflows (77 percent) and shallow groundwater (14 percent) on an annual basis.

The phosphorus budget focused on the summer monitoring period (May through October) when lake data were available for calculating net internal loading from mass balance equations. On average, 60 percent of the total phosphorus loading during the summer months came from net internal loading, 35 percent came from surface inflows, and 5 percent came from shallow groundwater inflow. Because internal loading is a significant source of phosphorus in Black Lake during the summer algae bloom period, a whole lake alum dose was identified as the most appropriate method to inactivate mobile sediment phosphorus.

Three alternative alum treatment scenarios were considered that differ in the timing and dose of the treatment due to uncertainties in funding, permitting, and contractor availability. The Spring 2016 Full Treatment Scenario was selected as the preferred scenario because it was the least cost and allowed more time for proper planning, permitting, and funding.

This water quality monitoring plan has been written in support of the Black Lake Alum Treatment Plan (Treatment Plan), which is concurrently being prepared to refine the alum dose and cost estimate, and provide additional details about the treatment procedures and timing. Additional background information is provided in the Treatment Plan. This monitoring plan was prepared in accordance with Guidelines and Specifications for Preparing Quality Assurance Project Plans (Ecology 2004), and includes monitoring elements specified in Ecology’s Aquatic Plant and Algae Management General Permit (Ecology 2015). This monitoring plan includes the following sections:

- Project description
- Project organization and responsibilities

- Data quality objectives
- Water quality monitoring design
- Sample collection procedures
- Analytical procedures
- Quality control
- Data management procedures
- Audits and reports
- Data verification and validation
- Data assessment (usability) assessment.

2. PROJECT DESCRIPTION

The alum application will occur on 3 to 4 consecutive days between April 11 and April 29, 2016. Liquid alum will be applied concurrently with liquid sodium aluminate as a buffer at a ratio of 2:1 by volume to ensure that the water pH does not decrease below 6.0. Sodium aluminate has been shown to be an effective buffer at this ratio, but the ratio may be adjusted depending on the chemical concentrations and results of on-site jar tests (to be implemented according to this monitoring plan). Treatment monitoring will be completed 2 weeks after the last day of alum application. Post-treatment monitoring will be conducted as part of routine lake monitoring by Thurston County.

The recommended total aluminum dose is 1.9 mg Al/L on a volumetric basis and 12.9 g Al/m² on an areal basis. This will require approximately 53,560 gallons of liquid alum and 26,780 gallons of liquid sodium aluminate over 509 acres (i.e., area within the 5-foot depth contour). The materials will be delivered in tanker trucks to a parking lot and pumped to holding tanks staged near the Washington Department of Fish and Wildlife (WDFW) boat launch, located on the southeast shore of Black Lake.

Each material will be injected into the lake surface waters from a boat or barge at a specified rate to ensure an even application at the recommended dose. The recommended dose is anticipated to meet water quality goals for at least 5 years, based on comparison to successful treatments for lakes located in relatively undeveloped watersheds like Black Lake (Herrera 2015).

2.1. Permit Restrictions and Relevant Criteria

The alum treatment will be conducted in accordance with Ecology's Aquatic Plant and Algae Management General Permit (Ecology 2015). This permit is currently being revised and the draft permit does not include any revisions to restrictions for alum treatments. Permit restrictions for alum treatments (see Table 4 in Ecology 2015) include:

- Timing restrictions:
 - None for fish or other priority species.
 - Early spring or fall treatment if aquatic plant biomass interferes with inactivation of sediment phosphorus.
- Lake use restrictions or advisories:
 - None.
- Treatment restrictions:
 - Application must cease when wind speed is greater than 15 miles per hour.
 - Powdered alum must be mixed with water to form a slurry before applying to the water surface.

- The pH of lake water during treatment must remain between 6.0 and 8.5 based on lake average.
- Only aluminum compounds suitable for water treatment may be used.
- Buffering materials must be available for use.
- Monitoring requirements:
 - Minimum monitoring is one surface water pH measurement in the morning prior to any alum addition and one surface water pH measurement 1 hour after alum addition has stopped for that day.
 - Monitoring for pH must continue for the duration of the treatment and for 24 hours following treatment completion.
 - Monitoring locations must be representative of water body-wide conditions.
- Other restrictions:
 - A jar test must be completed prior to whole lake treatments only if a buffer other than sodium aluminate is used or a ratio of liquid alum to liquid sodium aluminate differs from 2:1 by volume.
 - An on-site storage facility is required for any treatment requiring 9,000 gallons of alum or more, or the project proponent must have a plan to store any unused alum or buffering products.

The general permit allows for short- and long-term exceedance of Washington State Surface Water Quality Standards (WAC 173-201A) provided that the Permittee complies with any short-term modifications of water quality criteria authorized by Ecology in writing. Water quality degradation is allowed if the degradation does not significantly interfere with or become injurious to existing or designated water uses, or cause long-term harm to the environment (WAC-173-201A-410).

As for all undesignated lakes in Washington, Black Lake is to be protected for the designated uses of: core summer salmonid habitat and extraordinary primary contract recreation. The following parameters with associated surface water quality criteria will be monitored to evaluate short-term water quality impacts:

- Water temperature - The 7-day average of the daily maximum temperatures (7-DADMax) shall not exceed 16 °C, and human actions considered cumulatively shall not increase the 7-DADMax temperature more than 0.3°C if the natural temperature exceeds 16°C.
- Dissolved oxygen: The 1-day minimum dissolved oxygen concentration shall exceed 9.5 mg/L, and human actions considered cumulatively shall not decrease the dissolved oxygen concentration more than 0.2 mg/L
- pH: The pH shall be within the range of 6.5 to 8.5, with a human-caused variation within this range of less than 0.2 units

In addition, the National Recommended Water Quality Criteria for the protection of freshwater aquatic life (EPA 2015a) include the following criteria for total aluminum:

- Criteria maximum concentration (acute criterion) of 0.750 mg/L
- Criteria continuous concentration (chronic criterion) of 0.087 mg/L.

2.2. Project Goals and Objectives

Water quality monitoring will be conducted at Black Lake to protect aquatic biota during the 2016 alum treatment, and to evaluate the short-term and long-term effects of the treatment. The goals of water quality monitoring under this plan are to:

- Conduct a jar test before the alum treatment and measure pH in Black Lake during the alum treatment to ensure that pH levels exceed 6.0 for protection of aquatic biota from aluminum toxicity
- Collect water quality data before, during, and after the treatment to evaluate the short-term water quality effects of the alum treatment in the lake to ensure that pH criteria (between 6.0 and 8.7) and alkalinity criteria (greater than 12 mg/L) are met for protection of aquatic biota from aluminum toxicity
- Collect post-treatment water quality data to evaluate the long-term effectiveness of the alum treatment in relation to water quality goals that have been established for Black Lake

Treatment monitoring will be performed to determine if the following short-term water quality objectives are met:

- Average lake pH shall be between 6.0 and 8.7
- Average lake alkalinity in the lake shall be greater than 12 mg/L

Post-treatment monitoring will be performed to determine if the following long-term water quality objectives are met for at least 5 years (2016 through 2021):

- Summer average total phosphorus concentration shall be less than 24 µg/L
- Summer average chlorophyll α concentration shall be less than 7.2 µg/L
- Summer average Secchi depth (clarity) shall be at least 2.0 meters (6.6 feet)
- The lake will not be closed to recreational uses due to toxic cyanobacteria

3. PROJECT ORGANIZATION AND RESPONSIBILITIES

This section describes how the project is organized, key personnel, and the project schedule.

3.1. Organization and Key Personnel

BLS D is responsible for oversight of the Treatment Plan and the alum treatment project. Herrera Environmental Consultants (Herrera) is responsible for engineering oversight of the alum treatment, implementing this water quality monitoring plan, including pretreatment jar testing and treatment monitoring activities. IEH Analytical Laboratories is responsible for conducting the laboratory analysis for the treatment monitoring samples, and is certified by Ecology for all of the identified analytical procedures. Thurston County is responsible for long-term monitoring as part of routine summer lake monitoring. Specific responsibilities of key personnel are identified below:

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3.2. Schedule

Water quality monitoring activities for the 2016 Black Lake alum treatment project will primarily occur in April and May 2016 for short-term impact analysis, and continue during summer months for a period of at least 5 years for long-term impact analysis. Herrera will complete the jar test and treatment monitoring tasks. Post-treatment monitoring will be completed by Thurston County as part of their routine summer lake monitoring. The following monitoring activities will occur according to the schedule indicated:

- Jar Test: April 2016 (day prior to alum application).
- Treatment Monitoring: April through May 2016
 - Short-term Impact: Day before the first day of treatment, 2 days following last day of treatment, and 2 weeks following the last day of treatment.
 - Twice Daily: Morning and afternoon from first to last day of treatment.
 - Hourly: During alum application.
- Post-treatment Monitoring: Once a month from May through October for at least 5 years (2016 through 2021).

4. DATA QUALITY OBJECTIVES

The goal of this monitoring plan is to ensure that the data collected for this study are scientifically accurate, useful for the intended analysis, and legally defensible. To achieve this goal, the collected data will be evaluated relative to the following indicators of quality assurance:

- **Precision:** A measure of the variability in the results of replicate measurements due to random error
- **Bias:** The systematic or persistent distortion of a measurement process that causes errors in one direction (for example the measured mean is different from the true value)
- **Representativeness:** The degree to which the data accurately describe the conditions being evaluated based on the selected sampling locations, sampling frequency and duration, and sampling methods
- **Completeness:** The amount of data obtained from the measurement system
- **Comparability:** The ability to compare data from the current study to data from other similar studies, regulatory requirements, and historical data

Measurement quality objectives (MQOs) are performance or acceptance criteria that have been established for each of these quality assurance indicators. These MQOs are described below and summarized in Table 1. Note that the term “reporting limit” in this document refers to the practical quantification limit established by the laboratory, not the method detection limit.

4.1. Precision

Precision will be assessed by laboratory duplicates. These will be assessed using relative percent difference (*RPD*) as calculated using the following equation:

$$RPD = \left(\frac{|C_1 - C_2|}{C_1 + C_2} \right) \times 200\%$$

Where: RPD = Relative percent difference
 C_1 and C_2 = Concentration values

If either the sample or duplicate sample is at or below the reporting limit the MQO cannot be calculated. *RPD* values exceeding those identified in Table 1 will trigger an assessment as to whether there are any problems with laboratory methodology, which might warrant remediation.

Table 1. Measurement Quality Objectives for Water Quality Data.

Parameter	Analytical Method	Method Number	Maximum Holding Time	Reporting Limit Target and Unit	Method Blank	Control Standard Recovery	Matrix Spike Recovery	Laboratory Duplicate RPD
Laboratory Analysis								
Total alkalinity	Titrimetric, pH 4.5	EPA 310.1	14 days	1.0 mg/L CaCO ₃	≤ RL	80–120%	NA	≤ 20%
Dissolved aluminum	ICP-MS	EPA 200.8	6 months ^b	0.003 mg/L	≤ RL	85–115%	80–120%	≤ 20%
Total aluminum	ICP	EPA 200.7	6 months	0.100 mg/L	≤ RL	90–110%	75–125%	≤ 20%
Sulfate	Turbidimetric	EPA 375.4	28 days	1.00 mg/L	≤ RL	80–120%	75–125%	≤ 20%
Soluble reactive phos.	Auto. ascorbic acid	EPA 365.1	48 hours ^b	0.001 mg/L	≤ RL	80–120%	75–125%	≤ 20%
Total phosphorus	Auto. ascorbic acid	EPA 365.1	28 days	0.002 mg/L	≤ RL	80–120%	75–125%	≤ 20%
Chlorophyll a	Spectrophotometric	SM 10200 H	28 days	0.1 µg/L	≤ RL	NA	NA	≤ 20%
Field Analysis								
Total alkalinity	Titrimetric, pH 4.5	EPA 310.1	1 day	1.0 mg/L CaCO ₃	NA	NA	NA	NA
Secchi depth	20-cm disc	NALMS 1995	<i>in situ</i>	0.1 m	NA	NA	NA	NA
Temperature	Electrode	Field meter	<i>in situ</i>	± 0.2 °C	NA	NA	NA	NA
Dissolved oxygen	Electrode	Field meter	<i>in situ</i>	± 0.2 mg/L	NA	NA	NA	NA
pH	Electrometric	Field meter	<i>in situ</i>	± 0.2 std. units	NA	NA	NA	NA
Conductivity	Platinum electrode	Field meter	<i>in situ</i>	± 0.005 mS/cm	NA	NA	NA	NA

^a Method numbers from APHA (1998) and EPA (1983).

^b Samples must be filtered within 48 hours.

NA = not applicable, RL = reporting limit, RPD = relative percent difference.

4.2. Bias

Bias will be assessed based on analyses of method blanks, matrix spikes, and laboratory control samples (LCS). The values for method blanks will not exceed the reporting limit. The acceptable percent recoveries for matrix spikes and LCS are identified for each parameter in Table 1. Percent recovery will be calculated using the following equation:

$$\%R = \frac{(S - U)}{C_{sa}} \times 100\%$$

Where: %R = Percent recovery
S = Measured concentration in spike sample
U = Measured concentration in unspiked sample
C_{sa} = Actual concentration of spike added

If the analyte is not detected in the unspiked sample, then a value of zero will be used in the equation.

Percent recovery for LCS will be calculated using the following equation:

$$\%R = \frac{M}{T} \times 100\%$$

Where: %R = Percent recovery
M = Measured value
T = True value

4.3. Representativeness

Sample representativeness will be ensured by employing consistent and standard sampling procedures.

4.4. Completeness

Completeness will be assessed based on the percentage of specified samples (listed in this QAPP) collected. The completeness goal shall be 90 percent. Completeness for acceptable data is defined as the percentage of acceptable data out of the total amount of data generated. Acceptable data is either data that passes all QC criteria, or data that may not pass all QC criteria but has appropriate corrective actions taken.

4.5. Comparability

Standard sampling procedures, analytical methods, units of measurement, and reporting limits will be applied in this study to meet the goal of data comparability. The results will be tabulated in standard spreadsheets to facilitate analysis and comparison with water quality threshold limits (e.g., permit restrictions and water quality criteria), where appropriate.

5. WATER QUALITY MONITORING DESIGN

Water quality monitoring will include the following three components: jar test, treatment monitoring, and post-treatment monitoring. A jar test using the specified dose will be conducted on site immediately prior to the first day of alum treatment to verify that the lake pH will exceed 6.0 during the treatment. Treatment monitoring will include various elements to evaluate short-term effects of the treatment. Post-treatment monitoring will be conducted during subsequent summers over a period of at least 5 years to evaluate the long-term effects of alum treatment. The following sections describe the sampling locations and the design of each monitoring component. The overall monitoring design is summarized in Table 2.

Monitoring Component	Sampling Locations ^a	Analytical Parameters	Sampling Frequency
Pretreatment Jar Test	WDFW boat launch	Alkalinity, pH	Three or more tests as needed
Treatment Monitoring			
Short-term impact	North Basin station, South Basin station (surface, bottom)	Alkalinity, dissolved Al, total Al, sulfate, TP, SRP, chlorophyll a, Secchi depth, temperature/DO/pH/conductivity profile	Day before treatment, and 2 days and 2 weeks after treatment
Twice daily	North Basin station, South Basin station (surface, bottom)	Alkalinity (field), dissolved and total Al (if pH is less than 6.0), Secchi depth, temperature/DO/pH/conductivity profile	Morning before and evening after each day of treatment
Random daily	Treatment sites (surface, bottom)	pH profile and alkalinity (if pH is less than 6.0)	At least every 2 hours during treatment
Post-Treatment Monitoring	South Basin station (surface, bottom)	Secchi depth, TP, TN, chlorophyll a, temperature/DO/pH/conductivity profile	Monthly from May through October for at least 5 years

Al = aluminum

TP = total phosphorus

SRP = soluble reactive phosphorus

DO = dissolved oxygen

^a Treatment sampling stations include North Basin and South Basin at 1 meter below water surface and 1 meter above lake bottom. The post-treatment sampling station is the South Basin at 0.5 meter below water surface and 1 meter above the lake bottom; a composite sample will be collected from 1, 2, and 3 meters below the water surface for chlorophyll α analysis.

^b Dissolved and total aluminum will be analyzed only if the pH is less than 6.0.

5.1. Lake Monitoring Locations

Water quality monitoring will be conducted at two stations on Black Lake that have been used for previous monitoring projects to allow for comparison to historical data. The monitoring stations include (Figure 1):

- North Basin (NB-2) station: Located in the center of the northern basin in Black Lake, at a depth of approximately 23 feet.
- South Basin (SB-1) station: Located at the deepest (approximately 29 feet) point of the southern basin in Black Lake, along the southeast shore.

In addition, the pretreatment jar test will be conducted at the treatment staging area, which is located at the WDFW boat launch.

5.2. Jar Test

Jar tests will be conducted on the first day of alum treatment. This testing will be performed for pH using the alum treatment chemicals, dose, and application method described in the Treatment Plan using water and water quality conditions present at the time of application. This large-scale jar test will be performed at the alum treatment staging area located near the WDFW boat launch (see Figure 1).

A testing vessel (e.g., 5-gallon plastic bucket) will be filled with lake water and treated with aluminum sulfate and sodium aluminate directly taken from the supply trucks or storage tanks. As shown in Table 3, the jar test will be conducted using three ratios (1.9:1, 2.0:1, and 2.1:1) of alum and sodium aluminate to ensure correct buffering under current treatment conditions. A 1,000 microliter pipet will be used to inject the materials into 16 liters of lake water to achieve the 1.9 mg Al/L dose. The material amounts in Table 3 are based on a concentration of 4.2 percent of soluble aluminum for the alum and 32 percent of soluble NaAlO₂ for the sodium aluminate, and will be adjusted as necessary if different material concentrations are obtained. A control bucket with only lake water will also be tested.

Sample ID	Test Ratio ^a	Water (L)	Aluminum Sulfate (mL)	Sodium Aluminate (mL)
Test 1	2.1:1	16	0.242	0.115
Test 2	2.0:1	16	0.230	0.115
Test 3	1.9:1	16	0.219	0.115
Control	NA	16	0.00	0.00

^a Ratio of liquid aluminum sulfate (at 4.2 percent aluminum) to sodium aluminate (at 32 percent sodium aluminate).

L = liters.

The pH of the collected lake water will be tested immediately before treatment and after 2 minutes, 15 minutes, 30 minutes, and 1 hour after dosing. Monitoring results will be recorded and immediately reported to the Herrera Resident Engineer.

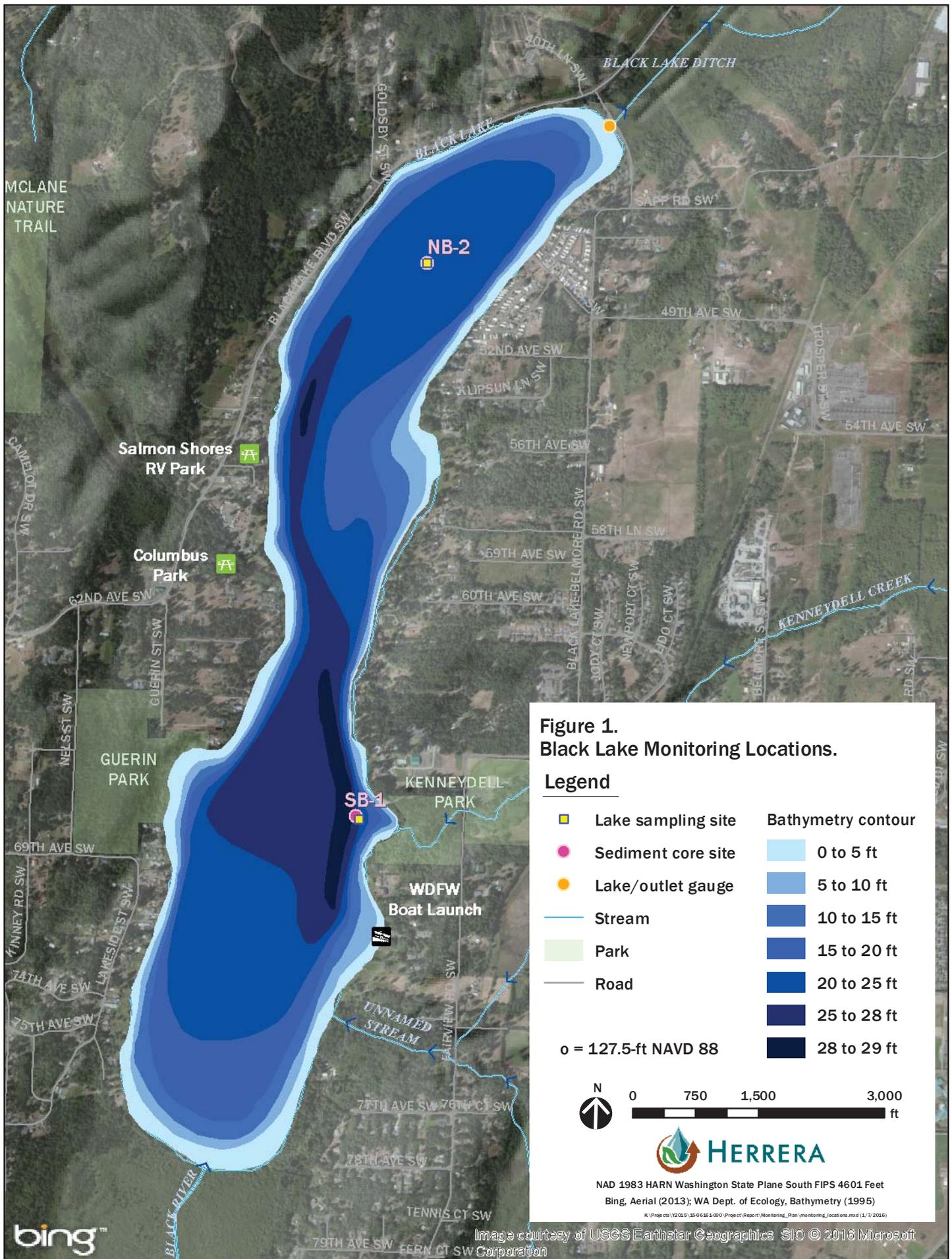


Figure 1.
Black Lake Monitoring Locations.

Legend

- | | | | |
|---|--------------------|---|--------------------|
|  | Lake sampling site |  | Bathymetry contour |
|  | Sediment core site |  | 0 to 5 ft |
|  | Lake/outlet gauge |  | 5 to 10 ft |
|  | Stream |  | 10 to 15 ft |
|  | Park |  | 15 to 20 ft |
|  | Road |  | 20 to 25 ft |
| | |  | 25 to 28 ft |
| | |  | 28 to 29 ft |
- o = 127.5-ft NAVD 88



NAD 1983 HARN Washington State Plane South FIPS 4601 Feet
 Bing, Aerial (2013); WA Dept. of Ecology, Bathymetry (1995)

K:\Projects\2016\15-0638\3000\Project\Report\Monitoring_Plan\monitoring_locations.mxd (1/7/2016)

Image courtesy of USGS Earthstar Geographics SIO © 2016 Microsoft Corporation



5.3. Treatment Monitoring

Treatment monitoring will be conducted by Herrera over a 3-week period, which will include the application of alum during approximately 4 days. Water quality monitoring for the treatment component is anticipated to occur in April 2016.

Treatment monitoring will include the following three elements:

- Monitoring before and after the alum addition to evaluate short-term impacts of the treatment on various water quality parameters at established monitoring stations.
- Twice-daily monitoring (in the morning before treatment begins and in the afternoon or evening when treatment ends) to verify that pH criteria (between 6.0 and 8.7) and alkalinity criteria (greater than 12 mg/L) are met at established monitoring stations.
- Random monitoring of pH and alkalinity during the alum application at treatment sites will be conducted at least once every 2 hours at specific treatment locations and allowing for 1 hour of alum settling.

Short-term impact monitoring will consist of measuring field parameters and collecting water samples from 1 meter below the water surface and 1 meter above the lake bottom at each of the following two stations: North Basin and South Basin stations. A total of four water samples will be collected from the lake on three occasions: 1) the day before the first day of treatment, 2) two days following the last day of treatment, and 3) two weeks following the last day of treatment. The collected samples will be analyzed for the following parameters:

- Secchi depth (field measurement)
- Temperature (field measurement at 1-meter intervals)
- Dissolved oxygen (field measurement at 1-meter intervals)
- pH (field measurement at 1-meter intervals)
- Conductivity (field measurement at 1-meter intervals)
- Total alkalinity
- Dissolved aluminum
- Total recoverable aluminum
- Sulfate
- Soluble reactive phosphorus
- Total phosphorus
- Chlorophyll α .

Twice-daily monitoring will consist of measuring field parameters at the North Basin and South Basin stations in the morning before treatment begins, and in the afternoon or evening when treatment ends. The field parameters include Secchi depth and vertical profiles of temperature, dissolved oxygen, pH, and conductivity at 1-meter intervals. In addition, total alkalinity will be tested in the field on water samples collected from 1 meter below the water

surface and 1 meter above the lake bottom at each of the three stations. If the pH is consistently less than 6.0 at a monitoring station, then the samples collected from that station will be analyzed for dissolved and total aluminum.

Random daily monitoring will consist of measuring pH at the treatment site during the alum application at a frequency of at least once every 2 hours. The pH will be measured at 1-meter intervals at the location where alum was applied approximately 1 hour before the time of sample collection. The 1 hour delay in sampling will allow for settling of the alum floc and stabilization of water quality conditions. If the pH is consistently less than 6.0 at a treatment site, then samples will be collected from 1 meter below the water surface and 1 meter above the lake bottom, and analyzed in the field for total alkalinity.

The alum treatment will be suspended if the pH is consistently less than 6.0 (± 0.05) or greater than 8.7 (± 0.05) in samples collected at the treatment sites or at the twice-daily monitoring stations. Additional monitoring will be conducted as necessary to determine when the lake pH and alkalinity have adequately recovered. Treatment may resume if the pH is greater than 6.2 and 8.4 (± 0.05) and the alkalinity is greater than 12 mg/L (± 0.5 mg/L) at all monitoring locations.

Observations of the alum treatment activities, floc formation, and potential fish and wildlife impacts will be made during random daily monitoring.

In the event that treatment monitoring data do not comply with the permit terms and conditions, Ecology's Northwest Regional Office will be notified immediately. In addition, observations of fish or wildlife impacts will be immediately reported to the Region 6 (Coastal) office of Washington Department of Fish and Wildlife (WDFW).

5.4. Post-Treatment Monitoring

It is anticipated that long-term water quality monitoring will be conducted by Thurston County Environmental Health for at least a 5-year period after the alum treatment has been completed. The objective of post-treatment monitoring will be to evaluate whether the total phosphorus goal (summer mean value less than 24 $\mu\text{g/L}$), chlorophyll α goal (summer mean value less than 7.2 $\mu\text{g/L}$), and Secchi depth goal (summer mean value greater than 2.0 meters) for Black Lake are being met.

Monitoring will occur once each month from May through October, beginning in May 2016. Post-treatment monitoring will consist of measuring field parameters and collecting water samples from 0.5 meter below the water surface and 1 meter above the lake bottom from the South Basin station. The samples will be analyzed for the following parameters:

- Secchi depth (field measurement)
- Temperature (field measurement at 1-meter intervals)
- Dissolved oxygen (field measurement at 1-meter intervals)
- pH (field measurement at 1-meter intervals)
- Conductivity (field measurement at 1-meter intervals)
- Total phosphorus
- Total nitrogen

Chlorophyll α will be measured in composite water samples typically collected from depths of 1, 2, and 3 meters, representing the epilimnion or surface layer of the lake.

In addition, if a cyanobacteria bloom is observed in Black Lake, Thurston County will collect scum samples from the lake for analysis of cyanotoxins and identification of phytoplankton species present in samples.

6. SAMPLE COLLECTION PROCEDURES

Measurements for field parameters will be made prior to the collection of water samples during treatment and post-treatment monitoring. Water temperature, dissolved oxygen, pH, and conductivity will be measured in situ by lowering the probe of a portable, multi-parameter water quality meter from a boat to record values at 1-meter intervals from the water surface to the lake bottom. The water quality meter will be calibrated according to the manufacturer's directions and following standard measurement procedures (APHA 1998).

Secchi depth will be measured by using a Secchi disk measuring 20 centimeters in diameter according to standard measurement procedures (NALMS 1995). The Secchi disk will be lowered from the sunny side of the boat to the depth where the disk disappears from view and raised to the depth where the disk reappears. Secchi depth is the average depth of the disk disappearance and reappearance. An underwater viewer (viewscope) will not be used during the measurement.

Water samples will be collected by deploying a clean Van Dorn sampler or similar sampling device from a boat. The sampler will be opened, lowered to the desired depth, and then closed by releasing the messenger.

For treatment monitoring, water samples will be collected from 1 meter below the lake surface and 1 meter above the lake bottom at treatment sites and two monitoring stations. Sample bottles will be filled directly from the Van Dorn sampler.

For post-treatment monitoring, water samples will be collected from 0.5 meter below the lake surface and 1 meter above the lake bottom at the South Basin station on each sampling event. Sample bottles will be filled directly from the Van Dorn sampler.

The following quality control procedures will be used in the field to ensure that data quality objectives are met.

6.1. Equipment Decontamination

The Van Dorn water sampler and any other sampling equipment will be decontaminated before each day of use. The equipment will be scrubbed with a brush and phosphate-free detergent (e.g., Liquinox®), and thoroughly rinsed with potable water followed by deionized water. Cleaned sampling equipment will be protected from contamination and will be rinsed with lake water prior to the collection of each sample.

6.2. Field Notes

At each water quality monitoring station, the following information will be recorded in a waterproof bound field notebook:

- Sample identification (ID)
- Sampling date
- Name of sampler

- Time of sample collection, measurement, or observation
- Station location
- Weather conditions
- Calibration results for field instruments
- Field measurements
- Number and type of samples collected
- Unusual conditions (e.g., oily sheen, odor, color, fish kill)
- Modifications of or unusual sampling procedures.

6.3. Sample Containers, Preservation, and Holding Times

Pre-cleaned sample containers will be obtained from the analytical laboratory for the required analyses. Spare sample containers will be carried by the sampling team in case of breakage or possible contamination. Sample containers, preservation techniques, and holding times will follow the analytical method requirements and US EPA guidelines (EPA 2015b).

6.4. Sample Identification and Labeling

Short-term and twice-daily samples will be identified by its station number (NB-2 or SB-1), depth (S for surface or B for bottom), and the date and time of collection in military format. For example, a sample collected from 1 meter depth at station NB-2 on April 16 at 8:00 am would be identified as sample NB-2-S-041616-0800. Random daily samples collected from treatment sites will be identified as the daily number of the treatment sample (T1, T2, etc.), and the date and time of collection in military format.

Prior to filling, sample containers will be labeled with the following information using indelible ink:

- Sample ID
- Date of collection (month/day/year)
- Time of collection (military format)
- Project ID (Black Lake)
- Company/sampler initials.

Labels on glass containers will be secured with clear adhesive tape.

6.5. Sample Handling

To minimize contamination, laboratory containers without preservative will be rinsed twice with sample water before filling. Samples will be stored at 4° C in a cooler and transported to the laboratory within 12 hours of collection. A chain-of-custody record will accompany the samples that clearly identifies the analytical parameters and methods.

7. ANALYTICAL PROCEDURES

Analytical methods are presented in Table 1 for field and laboratory parameters. Also included in Table 1 are the target reporting limits, units of measurement, and maximum sample holding times.

Field measurements of Secchi depth will be conducted using a 20-centimeter Secchi disk according to standard measurement procedures (NALMS 1995) (see Section 6). Field measurements of temperature, dissolved oxygen, pH, and conductivity will be conducted using a portable meter operated according to the manufacturer's directions and following standard measurement procedures (APHA 1998).

Laboratory analytical procedures will follow US EPA approved methods (APHA 1998; EPA 1983, 2015b). These methods provide detection limits that are below the state and federal regulatory criteria or guidelines, and will enable direct comparison of analytical results with these criteria.

The laboratory identified for this project (IEH Analytical Laboratories) is certified by Ecology for each of the analytical parameters, and participates in audits and inter-laboratory studies by Ecology and EPA. These performance and system audits have verified the adequacy of the laboratory standard operating procedures, which include preventative maintenance and data reduction procedures.

The laboratory will report the analytical results within 30 days of receipt of the samples. If necessary, the laboratory will provide draft results within hours of receipt of the samples. Sample and quality control data will be reported in a standard format. The reports will also include a case narrative summarizing any problems encountered in the analyses.

8. QUALITY CONTROL

Quality control procedures are identified below for laboratory activities. The overall objective of these procedures is to ensure that data collected for this project are of a known and acceptable quality. Quality control procedures that will be implemented in the laboratory are described in the following subsections. The frequency and type of quality control samples to be analyzed by the laboratory are summarized in Table 4.

Parameter	Laboratory Method Blanks	Laboratory Control Standard	Matrix Spike	Lab Duplicates
Total alkalinity	1/batch ^a	1/batch ^a	NA	1/batch ^a
Dissolved aluminum	1/batch ^a	1/batch ^a	1/batch ^a	1/batch ^a
Total recoverable aluminum	1/batch ^a	1/batch ^a	1/batch ^a	1/batch ^a
Sulfate	1/batch ^a	1/batch ^a	1/batch ^a	1/batch ^a
Soluble reactive phosphorus	1/batch ^a	1/batch ^a	1/batch ^a	1/batch ^a
Total phosphorus	1/batch ^a	1/batch ^a	1/batch ^a	1/batch ^a
Chlorophyll a	1/batch ^a	NA	NA	1/batch ^a

NA = not applicable.

^a Laboratory quality assurance samples will be analyzed with each batch of samples submitted to the laboratory for analysis. A laboratory batch will consist of no more than 20 samples.

8.1.1. Method Blanks

Method blanks consisting of deionized and micro-filtered pure water will be analyzed with every laboratory sample batch. A laboratory sample batch will consist of no more than 20 samples and may include samples from other projects. Blank values will be presented in each laboratory report.

8.1.2. Control Standards

Control standards for each parameter will be analyzed by the laboratory with every sample batch. A laboratory sample batch will consist of no more than 20 samples and may include samples from other projects. Control standard values and percent recovery will be presented in each laboratory report.

8.1.3. Matrix Spikes

For applicable parameters, matrix spikes will be analyzed by the laboratory with every sample batch. A laboratory sample batch will consist of no more than 20 samples and may include samples from other projects. Matrix spike values and percent recovery will be presented in each laboratory report.

8.1.4. Laboratory Duplicates

Laboratory duplicate samples will be analyzed by the laboratory with every sample batch. A laboratory sample batch will consist of no more than 20 samples and may include samples from other projects. Laboratory duplicate values and percent recovery will be presented in each laboratory report.

9. DATA MANAGEMENT PROCEDURES

This section discusses data management, which addresses the path of data from recording in the field or laboratory to final use and archiving. The data management and documentation strategy provides for consistency when collecting, assessing, and documenting environmental data and electronic storage of all documents and records on servers that are regularly backed up.

9.1. Data Management

The laboratory will report the analytical results within 30 days of receipt of the samples. The laboratory will provide sample and quality control data in standardized reports that are suitable for evaluating the project data. These reports will include all data including raw quality assurance results, and all quality control results associated with the data. The reports will also include a case narrative summarizing any problems encountered in the analyses, corrective actions taken, changes to the referenced method, and an explanation of data qualifiers. Laboratory analytical and quality assurance sample results will be delivered from the laboratory in both electronic and hardcopy form.

Both the laboratory and Herrera will retain project related data for 5 years after completion of the project.

9.2. Documentation and Records

Four types of documentation will be managed: 1) field operation records, 2) laboratory records, 3) data handling records, and 4) QAPP revision documentation.

9.2.1. *Field Operation Records*

Field operation records may include data sheets and field notes, and photographs taken of the described activities (when taken).

9.2.2. *Laboratory Records*

Laboratory records will include a data package (lab report in Excel® format). Hardcopy laboratory reports will not be issued by the project laboratory.

9.2.3. *Data Handling Records*

All documents associated with a sampling event will be stored electronically. Paper copies will not be archived. Each sampling event will be documented with the following records:

- Chain-of-Custody (COC)
- Field Reports (field notes)
- Data Package

All documents will be provided in portable document format (PDF) with the exception of the lab reports, which will be in Excel® format.

9.2.4. Revisions to the WQMP

In the event that significant changes to this WQMP are required prior to the completion of the study, a revised version of the document (with changes tracked) shall be prepared and submitted to the BLSO Project Manager for review. The approved version of the WQMP shall remain in effect until the revised version has been approved. Justifications, summaries, and details of expedited changes to the WQMP will be documented in the monitoring report.

10. AUDITS AND REPORTS

The following section describes the procedures used to ensure that this WQMP is implemented correctly and that the data generated is of sufficient quality to meet the project objectives, and that corrective actions, if necessary, are implemented in a timely manner. The procedures include audits and response actions; deficiencies, nonconformances, and corrective actions; and reports to management.

10.1. Audits and Response Actions

Audits will be conducted for field, laboratory, and data management activities, following the schedule outlined below in Table 5.

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Field Measurement Audit	Within 7 days of completion of sampling event	Data QA Officer	Review of field notes and data	Annotate field notes and notify field staff within 1 day
Laboratory Measurement Audit	Within 2 days of receiving laboratory data reports	Data QA Officer	Review analytical and quality control procedures employed at laboratory	Laboratory to respond in writing within 3 days to address corrective actions
Data Entry Audit	Within 7 days of data entry	WQ Monitoring Lead	Review all data entry values	Correct errors and repeat audit until no error found

10.2. Deficiencies, Nonconformance, and Corrective Action

The Herrera Project Manager is responsible for implementing and tracking corrective action procedures as a result of audit findings by the Data QA Officer. Records of audit findings and corrective actions are maintained by the Data QA Officer in the project file. Documentation of quality assurance issues will be made by the Data QA Officer in the project file and in quality assurance worksheets, if applicable.

Upon completion of an audit, the results will be reviewed to determine if a deficiency has occurred, and whether the deficiency is classified as a nonconformance. Deficiencies are defined as unauthorized deviations from procedures documented in the WQMP.

Nonconformances are deficiencies which affect data quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include but are not limited to instrument malfunctions and quality control sample failures.

The Herrera Project Manager, in consultation with the Data Quality Assurance Officer (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined a nonconformance does exist, the Herrera Project Manager, in consultation with the QA Officer, will determine the disposition of the nonconforming data or activity and necessary corrective action(s). Corrective actions may include the qualification of the data as estimates (J) or rejected (R). If the data is qualified as rejected (R), additional corrective actions may include collection of additional samples or reanalysis of the existing samples as authorized by the BLSD Project Manager.

10.3. Reporting

10.3.1. Data Quality Assurance Report

The Herrera Data Quality Assurance Officer (see Project Organization and Schedule section) will provide an independent review of the laboratory QC data from each sampling event using the MQOs that have been identified in this WQMP. A data quality assurance report will be prepared that summarize the following information:

- Changes in the monitoring plan
- Significant quality assurance problems and corrective actions
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability, and detection limits
- Discussion of whether the quality assurance objectives were met, and the resulting impact on decision-making
- Limitations on use of the measurement data.

10.3.2. Treatment Report

Herrera will prepare a treatment report presenting and summarizing all observations and data collected for treatment oversight and water quality monitoring. Water quality monitoring results will include jar tests and treatment monitoring in spring 2016. All post-treatment water quality monitoring will be conducted by Thurston County as part of routine summer lake monitoring, and those results will not be evaluated or reported by Herrera. Field and laboratory results will be tabulated in spreadsheets that include associated data qualifiers for estimated values, rejected values, and values exceeding established thresholds, objectives, or water quality criteria. A data quality assurance memorandum will be prepared that summarize the following information:

- Changes in the monitoring plan
- Significant quality assurance problems and corrective actions
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability, and detection limits
- Discussion of whether the quality assurance objectives were met, and the resulting impact on decision-making
- Limitations on use of the measurement data.

The treatment report will describe the engineering oversight and water quality monitoring methods, and present the data and findings. Treatment oversight results will be presented and summarized, and any deviations from the technical specifications will be identified. Water quality monitoring results will be compared to the permit requirements, and the short-term water quality impact of the alum treatment will be discussed.

11. DATA VERIFICATION AND VALIDATION

Data will be reviewed and audited within 14 business days of receiving the results from the laboratory (see *Audits and Reports* section). This review will be performed to ensure that all data are consistent, correct and complete, and that all required quality control information has been provided. Specific quality control elements for the data (see Table 1) will also be examined to determine if the MQOs for the project have been met. Values associated with minor quality control problems will be considered estimates and assigned *J* qualifiers. Values associated with major quality control problems will be rejected and qualified *R*. Estimated values may be used for evaluation purposes, while rejected values will not be used. The following sections describe in detail the data validation procedures for these quality control elements:

- Completeness
- Methodology
- Holding times
- Method blanks
- Reporting limits
- Duplicates
- Matrix spikes
- Control standards
- Sample representativeness

11.1. Completeness

Completeness will be assessed by comparing valid sample data with this WQMP and the chain-of-custody records. Completeness will be calculated by dividing the number of valid values by the total number of values. If fewer than 95 percent of the samples submitted to the laboratory are judged to be valid, then more samples will be collected until at least 95 percent are judged to be valid.

11.2. Methodology

Methodologies for analytical procedures will follow US EPA approved methods (APHA 1998 US EPA 1983) specified in Table 1. Field procedures will follow the methodologies described in this WQMP. Any deviations from these methodologies will be documented in the treatment report.

11.3. Holding Times

Holding times for each analytical parameter in this study are summarized in Table 1. Holding time compliance will be assessed by comparing sample collection dates and times analytical dates and times.

Data from samples that exceed the specified maximum holding times by less than 2 times the holding time will be considered estimates (*J*). Data from samples that exceed the maximum holding times by more than 2 times holding time will be rejected values (*R*).

11.4. Method Blanks

Method blank values will be compared to the MQOs that have been identified for this project (see Table 1). If an analyte is detected in a method blank at or below the reporting limit, no action will be taken. If blank concentrations are greater than the reporting limit, the associated method blank data will be labeled with a *U* (in essence increasing the reporting limit for the affected samples), and associated project samples within 5 times the reporting limit will be flagged with a *J*.

11.5. Reporting Limits

Reporting limits will be presented in each laboratory report. If the proposed reporting limits are not met by the laboratory, the laboratory will be requested to reanalyze the samples or revise the method, if time permits. Proposed reporting limits for this project are summarized in Table 1.

11.6. Duplicates

Duplicate results exceeding the MQOs for this project (see Table 1) will be noted, and associated values may be flagged as estimates (*J*). If the objectives are severely exceeded (such as more than twice the objective), then associated values may be rejected (*R*).

11.7. Matrix Spikes

Matrix spike results exceeding the MQOs for this project (see Table 1) will be noted, and associated values may be flagged as estimates (*J*). However, if the percent recovery exceeds the MQOs and a value is less than the reporting limit, the result will not be flagged as an estimate. Non-detected values will be rejected (*R*) if the percent recovery is less than 10 percent.

11.8. Control Standards

Control standard results exceeding the MQOs for this project (see Table 1) will be noted, and associated values will be flagged as estimates (*J*). If the objectives are severely exceeded (such as more than twice the objective), then associated values may be rejected (*R*).

11.9. Sample Representativeness

The data collected for this study will be labeled with unique quality assurance flags for both laboratory and field data quality issues. Table 6 presents the flagging scheme that will be used in the reports produced for this project.

Data Qualifier	Definition	Criteria for Use
J	Value is an estimate based on analytical results.	MQOs for field duplicates, laboratory duplicates, matrix spikes, laboratory control samples, holding times, or blanks have not been met.
R	Value is rejected based on analytical results.	Major quality control problems with the analytical results.
U	Value is below the reporting limit.	Based on laboratory method reporting limit.
UJ	Value is below the reporting limit and is an estimate based on analytical results.	Based on laboratory method reporting limit; MQOs for analytical results have not been met.

12. DATA QUALITY (USABILITY) ASSESSMENT

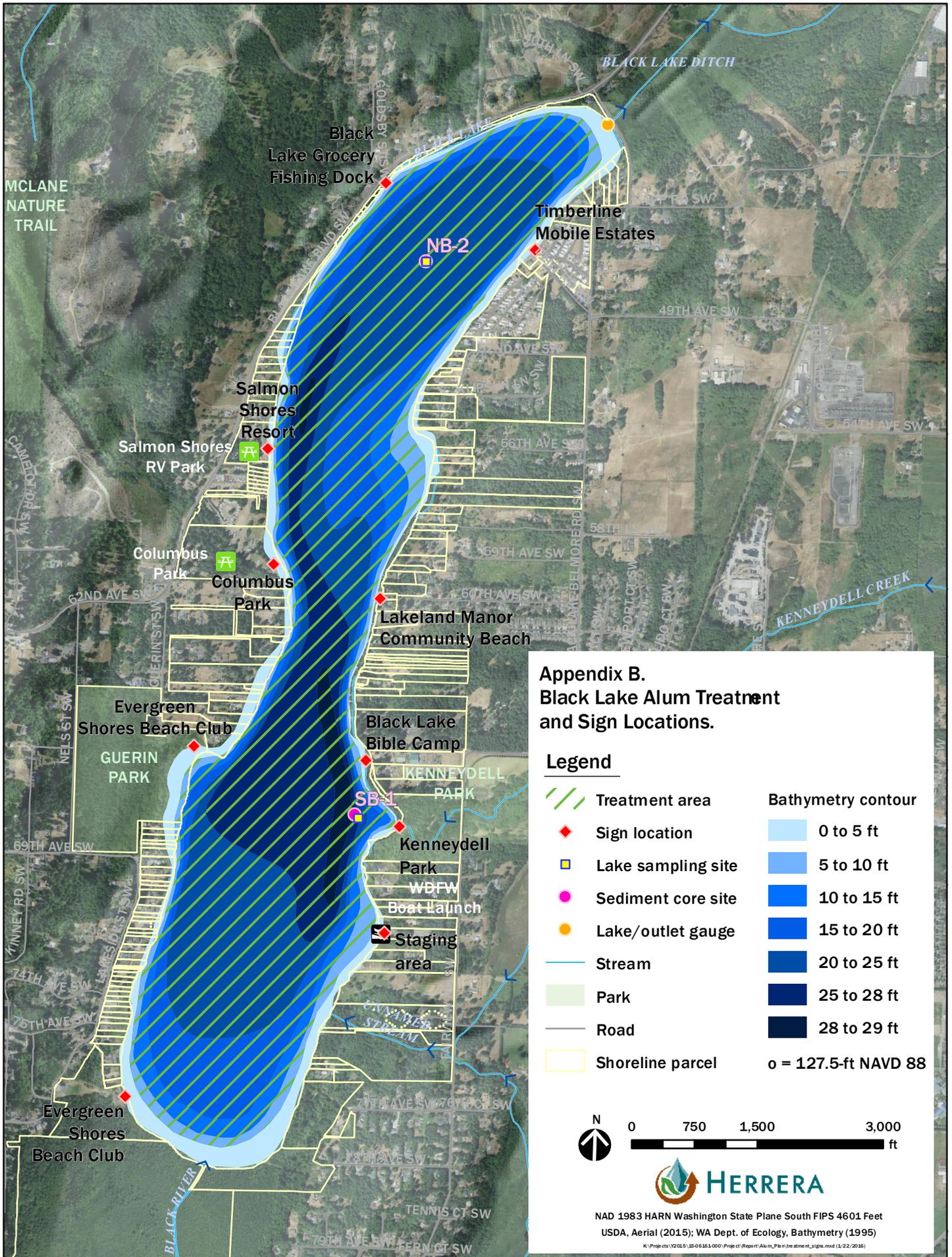
Data quality assessment for this project will include applying the data quality objectives and sampling design, preparing summary tables, and drawing conclusions from the data. Conclusions from this monitoring project will be drawn based on comparisons with water quality standards and historical values.

13. REFERENCES

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- Herrera. 2015. Black Lake Phosphorus and Algae Control Plan. Prepared for the Black Lake Special District, Olympia, Washington, by Herrera Environmental Consultants, Inc., Seattle, Washington. January 21, 2015.
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APPENDIX B

Black Lake Treatment and Signage Locations Map



APPENDIX C

Staging Area and Access Route



Legend

- Sodium Aluminate
- Alum
- Chemical tanker truck
- ➔ Access route

**Appendix C.
Black Lake Staging Area
and Access Route.**



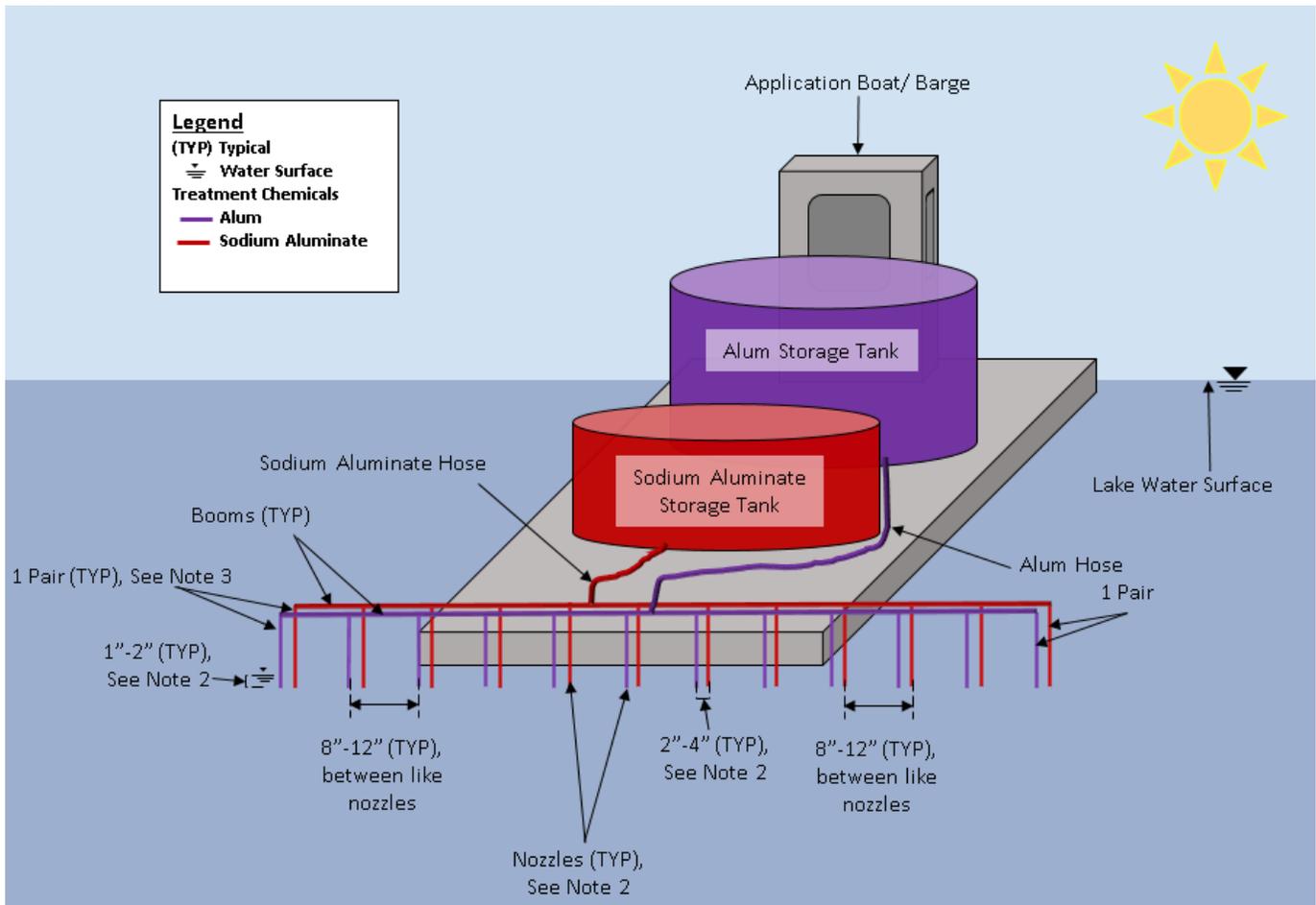
Google, Aerial (2015)



APPENDIX D

Chemical Distribution System Schematic

Appendix D – Chemical Distribution System Schematic.



Notes:

1. View is looking at the stern (back) of the application boat.
2. Nozzles of alum and sodium aluminate should be 2 to 4 inches apart and extend 1 to 2 inches below the water surface (TYP).
3. The chemicals are to be delivered to the lake water from a minimum of 12 pairs and up to a maximum of 24 pairs of alum and sodium aluminate nozzles.

APPENDIX E

Permits

Issuance Date: Month/Year
Effective Date: Month/Year
Expiration Date: Month/Year

DRAFT
AQUATIC PLANT AND ALGAE MANAGEMENT
GENERAL PERMIT

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit

State of Washington
Department of Ecology
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

Until this permit expires, is modified or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions that follow.

Heather R. Bartlett
Water Quality Program Manager
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for submittal requirements.

Table 1. Required permit submittals

Permit Section	Submittal	Frequency	Due Date(s)
S2	Application for New Coverage	As necessary	At least 38 days prior to the start of discharge
S2.D	Request for Modification	As necessary	As necessary
S2.E	Request for Transfer of Coverage	As necessary	As necessary
S3.F & S9	Plant Survey and Mitigation Measures	As necessary	As necessary
S5.A	Ecology Pre-and Post-Treatment Notice	Each week or as necessary during the treatment season	By 8:00 a.m. Monday of the first week of treatment each treatment season
S5.C	Business and Residential Notice	As necessary	No later than one business day following notification
S6.A	Dissolved Oxygen Data from 303(d) – Listed Water Bodies for Dissolved Oxygen When Using Contact Herbicides	As necessary	Within 30 days for the post-treatment monitoring date
S7.A	Annual Monitoring Report	Annually	December 31
S7.D	Noncompliance Notification	As necessary	As necessary
G22	Re-Application for Permit Coverage	Once per permit cycle	At least 180 days prior to the permit expiration date

The text of this permit contains words or phrases in ***bold and italics***. These words or phrases are the first usage in the permit and are defined in Appendix A.

SPECIAL PERMIT CONDITIONS

S1. PERMIT COVERAGE

The Aquatic Plant and Algae Management General Permit regulates the use of *pesticides* and other products applied to manage *aquatic nuisance plants, noxious weeds, quarantine-listed weeds, algae*, and phosphorous in fresh *surface waters of the state of Washington*.

A. Activities Covered Under This Permit

This general permit covers aquatic plant and algae management activities that result in a discharge of *herbicides, algaecides, adjuvants, marker dyes, shading products, biological water clarifiers*, and *phosphorous inactivation products* (referred to hereafter as chemicals) into fresh water bodies of the state of Washington. The permit also covers *shoreline* and roadside/ditch bank *emergent vegetation* management activities where chemicals may enter the water.

Aquatic plant and algae management activities are organized into four categories: Noxious Weed *Control*, Native Nuisance Plant Control, *Algae Control*, and phosphorous inactivation. The permit has different requirements for each category.

1. Aquatic noxious weed control

- a. *Littoral zone* limitations do not apply to control of noxious weeds or weeds on the quarantine list, but some *treatment* limitations may apply - see (2) below. The *Permittee* may *intentionally apply* herbicides to:
- b. 100 percent of noxious weeds if they are Class A weeds, Class B weeds in areas where they are designated for control, as identified in chapter 16-750 WAC, and Class C weeds where they are selected for control by a county Noxious Weed Control Board (RCW 17.10.080).
- c. 100 percent of any *submersed* noxious or quarantine-list weeds not covered under (1) if the Permittee conducts weed control using a *selective herbicide*.
- d. 100 percent of any *emergent* or *floating-leaved* noxious weeds and quarantine listed weeds.

2. Aquatic nuisance plant control

The Permittee may intentionally apply chemicals to: A percentage of a water body's littoral zone based on the littoral acres of the water body and the size of the water body. Direct herbicide application is limited to a percentage of the littoral zone for control treatments to preserve native plant habitat.

- a. The geographic area where the Permittee intentionally applies chemicals must remain the same for the entire length of the permit coverage up to the maximum percentage of the littoral zone allowed for by water body size.
- b. All untreated littoral areas must include native vegetation from the shore to the edge of the littoral zone where the plants stop growing in deeper water.
- c. The cumulative percentage of the littoral zone where herbicides¹ may be intentionally applied must not exceed the amount allowed below:
 - (1) In water bodies up to 15 acres in size, the Permittee may intentionally apply herbicides to no more than 75 percent of the littoral zone.
 - (2) In water bodies over 15 acres and up to 50 acres in size, the Permittee may intentionally apply herbicides to no more than 60 percent of the littoral zone.
 - (3) In water bodies over 50 acres and up to 500 acres in size, the Permittee may intentionally apply herbicides to no more than 50 percent of the littoral zone.
 - (4) In water bodies over 500 acres in size, the Permittee may intentionally apply herbicides to no more than 30 percent of the littoral zone.
- d. **Individual lot** aquatic nuisance plant control
 - (1) No more than 25 feet on either side of a dock or no more than an area 50 feet wide per **lot** for **individual treatments** targeting **submersed plants** and **floating-leaved plants**. Treatment of the vegetated area may extend up to 25 feet beyond the end of the dock. On individual lots with no docks, treatment of the vegetated area can extend up to 50 feet from the shore.
 - (2) No more than 40 percent of emergent shoreline plants on individual lots for individual treatments.
- e. Roadside, ditch bank, and flood control structure plant control
 - (1) For activities conducted by state and local agencies, the Permittee may intentionally apply herbicides to 100 percent of the plants within the **right-of-way** and on **levees and dikes**.
 - (2) The Permittee may intentionally apply herbicides to no more than 40 percent of native vegetation of roadsides and ditches on privately owned

¹ Different littoral zone limitations apply to the herbicide fluridone. See Treatment Limitations in Table 3.

individual lots, but may intentionally apply herbicide to 100 percent of any noxious or quarantine-listed weeds.

3. Algae control

- a. The Permittee may intentionally apply algaecides to filamentous green algae provided the treated areas do not exceed the maximum amount of littoral zone allowed for treatment in S1.A.2.c.
- b. The Permittee may intentionally apply algaecides to the entire water body or sections of the water body, as needed, when *cyanobacteria* or other potentially toxic or environmentally harmful algae species are in the water body.

4. Phosphorous inactivation

The Permittee may intentionally apply approved *buffering agents*, alum, calcium hydroxide/oxide and calcium carbonate as phosphorous inactivation products to the entire water body or sections of the water body per permit sections S4.D Table 4 and S6.B. Limited use of other phosphorous inactivation products is allowed under permit section S4.C.2.

B. Geographic Area Covered

This permit covers the activities listed in S1.A within the State of Washington.

This permit does not apply to:

1. Federal lands where a federal agency provided funding, made the decision to apply chemicals, or is the entity applying chemicals.
2. Indian Country and trust or restricted lands except portions of the Puyallup Reservation as noted below.
3. Puyallup Exception: Following the Puyallup Tribe of Indians Land Claims Settlement Act of 1989, 25 U.S.C. §1773; this permit does apply to land within the Puyallup Reservation except for discharges to surface water on land held in trust by the federal government.

C. Activities Excluded from Coverage Under This Permit

Ecology will not require coverage under this permit for the use of chemicals on the following sites; with the exception of locations identified as critical habitat for Oregon spotted frogs as defined by the U.S. Fish and Wildlife Services (<http://www.fws.gov/wafwo/osf.html>):

1. Constructed *detention or retention ponds* designed specifically for wastewater or stormwater treatment that do not discharge to other water bodies during and for two

weeks after treatment, or where Ecology regulates the discharge under another permit that allows chemical treatment.

2. Any **constructed water body** five acres or less in surface area with no discharge to other surface waters of the state during and for two weeks after treatment.
3. Any constructed water body ten acres or less in surface area under single ownership with no **public access** and no discharge to other surface waters of the state during and for two weeks after treatment.
4. **Farm ponds** with no discharge to other surface waters of the state during and for two weeks after treatment.
5. Treatment conducted on **seasonally dry land surfaces** (including seasonally dry **wetlands**) so long as the treatment occurs when the area is dry and the active ingredient is not biologically available when the water returns.
6. Research activities when applying chemicals or products to water bodies under a **State Experimental Use Permit** (See S4.C).

S2. APPLICATION FOR COVERAGE

Ecology may modify this permit to require electronic submittal of the Permit Application, Annual Report, Monitoring Report, Transfer of Coverage, or Notice of Termination when an electronic reporting system becomes available.

A. Who May Obtain Permit Coverage

1. **Licensed pesticide applicators (applicators)**(WAC 16-228-1545) may apply for coverage. Applicators must be licensed in Washington State with an aquatic endorsement (WAC16-228-1545 3(t)).
 - a. Applicators must obtain separate permit coverage for each water body that they plan to treat. Each coverage requires a **sponsor**. Applicators may obtain a single permit coverage for multiple water bodies where a single, non-governmental sponsor has authority to treat more than one water body. The water bodies need not be hydraulically connected, but must be part of the same distinct community (e.g., ABC Homeowners Association).
 - b. In water bodies with multiple sponsors or multiple permit coverages, applicators must obtain separate permit coverages for each location within the water body (e.g., Lake Washington).
2. Dischargers are not required to be licensed pesticide applicator to apply phosphorous inactivation chemicals, because phosphorous inactivation products are not registered pesticides, EPA and WSDA do not regulate their use. For these projects, the discharger may apply for permit coverage. **Applicants** must have a sponsor for each phosphorous inactivation coverage.

3. Any state or local government entity may apply for coverage.
 - a. Government entities may obtain a single coverage that includes multiple water bodies under its jurisdiction. Government entities are considered sponsors.
 - b. Government entities must keep Ecology updated with a current list of its applicators, including license numbers and license expiration dates.

B. How to Apply for Coverage

Applicants that propose to begin aquatic plant or algae management activities that will result in a discharge to waters of the state on or after the effective date of this permit must:

1. Complete the *Notice of Intent* (NOI) for the proposed activity online. The applicant must access Ecology's online data management system *SecureAccess Washington* (<http://secureaccess.wa.gov>), fill out the NOI online, print it, and sign it. Applicators must ensure that their sponsor(s) also sign the document.
2. If the product label has potable water use restrictions and the treatment occurs in water bodies with *municipal or community drinking water intakes*, the applicant must obtain and submit written consent to the treatment from the municipality or community.
3. Mail the complete NOI to:
Department of Ecology
Water Quality Program
Attn: Aquatic Pesticide Permit Manager
P.O. Box 47600
Olympia, WA 98504-7600
4. After the applicant has submitted the completed NOI to Ecology, they must fill out the Public Notice Template provided in the NOI. Publish the public notice twice, one week apart, in a local newspaper of general circulation (or a regional newspaper if a local newspaper is not available) that an application for permit coverage has been made. At the time the second notice is published, a 30-day comment period begins.
5. Mail or deliver the public notice to all potentially affected waterfront residents (those within one-quarter mile in each direction along the shoreline or across the water from proposed treatment areas) within one week of publishing the first newspaper notice.
6. Mail or deliver the public notice to the Washington State Department of Natural Resources (DNR) at: (Todd.Brownlee@dnr.wa.gov)

7. Mail or deliver the public notice for permit coverages in Water Resource Inventory Areas 7 (Snohomish), 8 (Cedar/Sammamish), and 9 (Duwamish/Green) (<http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm>) to Nancy.Rapin@muckleshoot.nsn.us and Karen.Walter@muckleshoot.nsn.us. In the event that the email contacts become out-of-date Ecology will provide updated contact information.

At the end of the required 30-day public comment period, Ecology will consider comments about the applicability of this permit to the proposed aquatic plant or algae management activity before issuing a decision on permit coverage.

C. Permit Coverage Timeline

1. If the applicant does not receive notification from Ecology, permit coverage automatically commences on whichever of the following dates occurs last:
 - a. The 31st day following receipt by Ecology of a completed application for coverage.
 - b. The 31st day following the end of a 30-day public comment period.
 - c. The effective date of the general permit.
2. Ecology may need additional time to review the application:
 - a. If the application is incomplete.
 - b. If it requires additional site-specific information.
 - c. If the public requests a public hearing.
 - d. If members of the public file comments.
 - e. When more information is necessary to determine whether coverage under the general permit is appropriate.
3. When Ecology needs additional time:
 - a. Ecology will notify the applicant in writing before the 31st day following the end of the 30 day public comment period and identify the issues that the applicant must resolve before a decision can be reached.
 - b. Ecology will submit the final decision to the applicant in writing. If Ecology approves the application for coverage, coverage begins the 31st day following approval, or the date the approval letter is issued, whichever is later.

D. How to Modify Permit Coverage

Entities that propose changes to the aquatic plant and algae control activities authorized by their original permit coverage, such as expanding the area covered, must revise and re-submit permit application materials in accordance with Special Condition S2.B.

E. How to Transfer Permit Coverage

A Permittee may transfer coverage to a new Permittee, in accordance with General Condition G7 of this permit, using the Transfer of Coverage Form found here:

<https://fortress.wa.gov/ecy/publications/SummaryPages/ECY070348.html>.

Both the original Permittee and the new Permittee must sign the form and provide the date that the new Permittee will take responsibility for permit coverage. Once both parties have signed the form, the new Permittee becomes responsible for permit compliance and permit fees on the date indicated on the form. The original Permittee remains responsible for, and subject to, all permit conditions and permit fees until the transfer is effective.

F. How to Terminate Permit Coverage

When a Permittee no longer has or plans to discharge they may request termination of permit coverage by submitting a completed Notice of Termination (NOT) form found here: <https://fortress.wa.gov/ecy/publications/SummaryPages/ECY100300.html>.

The Permittee will continue to incur an annual permit fee unless it submits a NOT form even if no application of pesticides takes place. Once permit coverage is cancelled, the Permittee may no longer discharge to waters of the state unless it applies for, and gains coverage under this permit again.

S3. DISCHARGE LIMITS

A. Compliance with Standards

1. The application of pesticides must not cause or contribute to a violation of the Water Quality Standards for Surface Waters of the State of Washington (chapter 173-201A WAC), Ground Water Quality Standards (chapter 173-200 WAC), Sediment Management Standards (chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CRF 131.36). Ecology prohibits discharges that do not comply with these standards.
2. Permittees must use all known, available, and reasonable methods of pollution control, prevention, and treatment (AKART) when applying pesticides. Compliance with this permit, the Washington Pesticide Control Act and the

requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label constitute AKART.

B. Temporary Exceedance of Water Quality Standards

Short and long-term exceedance of water quality standards are allowed under this permit provided the Permittee complies with the provisions of WAC 173-201A-410.

C. Application Requirements

The Permittee must comply with the FIFRA label when using pesticides. Permit requirements do not reduce the requirements on the FIFRA label. The Permittee must ensure that:

1. A licensed pesticide applicator, with the appropriate Washington State Department of Agriculture (WSDA) license and certification, has *direct supervision responsibilities* for the use of pesticides during application.
2. All applicators (either under the direct supervision of the licensed applicator for pesticides or under the supervision of the discharger for non-pesticides) have current training in the use of the equipment necessary to apply chemicals correctly and that they use approved application techniques.
3. Appropriately trained personnel calibrate the application equipment for the chemical used.
4. Phosphorous inactivation products are not labeled as pesticides by FIFRA and dischargers are not required to be licensed pesticide applicators.

D. Impaired Water Bodies

1. The Permittee must not cause further permanent impairment of any *303(d)-listed* water body for any listed parameter.
2. The Permittee must prevent further permanent impairment of water bodies listed on the 303(d) list for dissolved oxygen as a result of treatment. It may do so by choosing appropriate chemicals such as a *systemic herbicide* instead of a *contact herbicide* and must implement one or more of the following mitigation measures:
 - a. Do not treat in the summer or when water temperatures are warm enough to contribute to low dissolved oxygen concentrations after treatment.
 - b. Limit the area treated each time that treatment occurs.
 - c. Remove decaying plants following treatment.
 - d. Aerate the water following treatments.

3. The Permittee must prevent further permanent impairment of water bodies listed on the 303(d) list for phosphorous as a result of treatment. It may do so by choosing appropriate chemicals to minimize release of phosphorous from non-target plants or algae and must implement at least one or more of the following mitigation measures.
 - a. When treating for a *floating plant* such as duckweed or for algae blooms ensure that a healthy population of native emergent, submersed, or floating-leaved plants remain in the water body after treatment.
 - b. Time treatment so that plant nutrients are not released during summer months.
 - c. Limit the area treated at any one time.
 - d. Remove decaying plants following treatment

E. Identified Wetlands

The Permittee may treat only *high use areas* to provide for safe *recreation* (e.g., *defined swimming corridors*) and boating (e.g., *defined navigation channels*) in *identified and/or emergent wetlands*. The Permittee must limit the treated area to protect native wetland vegetation.

F. Additional Requirements for Discharges to Water Bodies Where Sensitive, Threatened, or Endangered Plants Are Present

Before issuing permit coverage, Ecology will determine whether *sensitive, threatened, or endangered (rare) plants* are present in the proposed treatment area. If present, for *aquatic plant control* projects, the Permittee must submit a detailed plant survey and implement mitigation measures according to Special Condition S.9.

S4. THE APPLICATION OF PRODUCTS

A. Prohibited Discharges

Treatment that causes oxygen depletion to the point of stress or lethality to aquatic biota from plant or algae die-off, the mortality of aquatic vertebrates, or unintended impacts to water quality or biota are prohibited.

B. Authorized Discharges

1. Beginning on the effective date of this permit and until Ecology modifies, reissues, or revokes this permit; this permit authorizes the Permittee to discharge the chemicals listed in the permit into freshwaters of the state.

2. This permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to *private property* or any invasion of personal rights.
3. The Permittee may apply the adjuvants listed in Table 2 and the active ingredients listed in Table 3 that are labeled for aquatic use, phosphorous inactivation products and approved buffering agents listed in Table 4, marker dyes, water clarification products (including bacterial products) and straw listed in Table 5.
4. The Permittee must comply with the specific restrictions/limitations listed in Tables 3-5.

Table 2: Listed Adjuvants

Adjuvant (Trade Name)/State Registration Number	
Agri-Dex™/5905-50094	Kinetic™/5905-11004
AgriSolutions Inergy®/1381-13001	Level 7™/1381-05002
Atmos™/1381-13006	LI-700™/34704-04007
Bond™/34704-04003	Liberate™/34704-04008
Breeze®/1381-13007	NIS-EA™/2935-14001
Bronc Max™/2935-03005	One-Ap XL™/45989-02001
Bronc® Plus Dry/2935-12005	Pro AMS Plus™/71058-50001
Bronc Plus Dry-EDT™/2935-03002	Rainier-EA™/2935-15001
Cide-Kick IIM®/99940/12001	Renegade-EA™/2935-15002
Class Act NG™/1381-01004	Sinker™/5905-05001
Competitor™/2935-04001	Sphere 7/73127-10008
Cut-Rate™/2935-06001	Spray-Rite™/7001-09003
Cygnnet Plus™/105114-50001	Superb HC™/1381-06003

Adjuvant (Trade Name)/State Registration Number	
DestinyHC™/1381-12001	Syl-Tac-EA™/2935-15004
Droplex™/1381-12001	Tactic™/34704-05008
Dyne-Amic™/5905-50071	Trail Blazer/91327-15009
Fast Break®/1381-50006	Tronic™/45989-06003
Forge/46661-15002	Turbulence®/1381-13008
Fraction™/45989-06001	Winfield Solutions Inergy®/ 1381-13002
Hasten-EA™/2935-15003	Yardage™/52467-13001
Interlock™/1381-05004	

C. Experimental Use

1. The Permittee may apply chemicals not listed in this permit on a limited basis in the context of a research and development effort under the jurisdiction of the Environmental Protection Agency (EPA) through the issuance of a federal experimental use permit (40 CFR 172) and the WSDA through the issuance of a state experimental use permit (EUP).
 - a. Project proponents must obtain coverage under this general permit for any in-water projects conducted under a federal EUP (projects over one acre or more in size), unless the project is conducted at a site excluded from coverage under this permit.
 - b. Ecology does not require coverage under this general permit for research and development projects of one acre or less in size where the project proponent operates under a state EUP (issued by WSDA).
2. The Permittee may apply phosphorous inactivation products not listed in this permit on a limited basis in the context of a research and development effort provided the Permittee develops an experimental phosphorous inactivation plan. The plan must be reviewed and approved by Ecology prior to treatment. The experimental phosphorous inactivation plan must include the following elements:
 - a. A public announcement of the project proposal must be made through newspaper notice, public meeting or through mailings to affected and

interested parties. The public notice must be followed by a 30 day public comment period with all comments being submitted to Ecology.

- b. A problem statement that clearly identifies the need for the use of an experimental phosphorous inactivation product and identifies potential effects on aquatic organisms.
- c. A description of the project objectives and expected results.
- d. A schedule for treatment, monitoring and reporting.
- e. Proposal for the application of experimental phosphorous inactivation product(s).
- f. Pre-treatment monitoring and water quality testing. Description of how the experimental phosphorous inactivation product(s) will be applied, including amount of chemical proposed for use and calculations used.
- g. Monitoring of water quality parameters before, during and after the application of the experimental phosphorous inactivation product.
- h. Reporting
 - i. Pounds of product used
 - ii. Acreage treated
 - iii. phosphorous reduction
 - iv. Description of whether the objectives were achieved.
 - v. Monitoring results, including any observed or measured, impacts or stress to aquatic organisms or wildlife.

D. General Application Restrictions

1. Treatments are prohibited with pesticides that have water use restrictions on the FIFRA label that restrict public water use during the opening week of fishing season or during tribal fisheries, WDFW Free Fishing Weekend, Memorial Day weekend, Independence Day weekend, and Labor Day weekend.
2. Permittees must minimize treatments that restrict public water use during weekends.
3. When there are potable water restrictions on the label and the treatment is within the setback distance listed on the product label, the Permittee must not apply any chemical until it has notified people who withdraw potable water from the water body. If requested by the affected water user(s), the Permittee must provide an alternative potable water supply until the intake water tests at or below the concentration specified for that pesticide in the product label for potable water. If requested by an affected water user, the Permittee must provide at least two weeks

advance notice of pending treatments.

4. People withdrawing water under a legal ***water right*** or claim for irrigation or livestock watering purposes may request an alternate water supply during the treatment if the label has restrictions for those uses and the treatment is inside the setback distance listed on the product label. The Permittee must provide an alternative water supply until the intake water tests at or below the irrigation restriction concentration or livestock drinking water concentration on the label or until the time interval specified on the label has elapsed. If requested by an affected water user, the Permittee must provide at least two weeks advance notice of pending treatments.
5. The Permittee must not conduct treatments that adversely affect salmon or steelhead in hatcheries when applying treatments to areas upstream of a hatchery water intake. Ecology will coordinate with the Permittee, the Washington State Department of Fish and Wildlife (WDFW), and affected tribes to ensure treatments proposed upstream of a hatchery intake do not adversely affect hatchery fish or hatchery operations.
6. The Permittee must ensure that there is adequate contact time between the targeted vegetation and the selected herbicide when treating in reservoirs or in flowing water to avoid non-target downstream impacts.
7. The Permittee must comply with WDFW timing windows referenced in Tables 3 and 4 to protect salmon, steelhead, and bull trout populations and WDFW ***priority habitats and species***. WDFW may periodically update this table as new information becomes available or on request from Ecology. The timing table is available at: http://www.ecy.wa.gov/programs/wq/pesticides/final_pesticide_permits/aquatic_plants/aquatic_plant_permit_index.html.
 - a. Permittees conducting treatments subject to existing timing windows due to the presence of listed sensitive, threatened or endangered species, identified in tables 3 and 4 as requiring consultation, must follow the guidance provided by WDFW during consultation.
 - i. For treatments where WDFW does not provide additional guidance the Permittee must follow the timing windows.
 - b. Timing windows do not apply to nonnative fish such as bass. At their discretion, Permittees may choose to comply with the bass timing windows noted in the WDFW timing table.
 - c. Timing windows do not apply to treatments conducted for emergent and shoreline plants.

- d. Timing windows do not apply to treatments conducted for roadside, ditch bank and flood control structure plant control (S1.A.2.e).
- e. Permittees may consult with Ecology and WDFW to develop alternate timing windows if necessary so long as the new treatment windows do not adversely impact priority species and habitats. Contact Julie Henning of WDFW at Julie.Henning@dfw.wa.gov and apampreposttreat@ecy.wa.gov to request development of alternative timing windows. In the event that the email contacts become out-of-date, Ecology will provide updated contact information.
 - i. Where Permittees are directed to consult with WDFW in the timing window table, they must provide Ecology with a consultation letter from WDFW indicating the approved timing window for the treatment.
- f. The Permittee must follow the specific restrictions and advisories identified in Tables 3, 4 and 5. **Swimming restrictions**/advisories apply to primary contact activities such as swimming, wading, and water skiing. Drinking water restrictions apply to residents drinking lake water as their sole source of potable water or where they hold a water right for potable water.

Table 3: Specific Restrictions on the Application of Herbicides and Algaecides for Control Projects

Active Ingredient	Subject to Timing	Restrictions/ Advisories	Treatment Limitations	Other Specific Restrictions
2, 4 – D (amine)	Yes for salmon, steelhead, bull trout – check timing table for other priority species	Swimming advisory during treatment, and for 24-hours post-treatment (in the treated area)	Control projects only: Do not apply within 400 feet of an outlet stream if there is an outflow.	Consult FIFRA product label for water use restrictions
2, 4 – D (ester)	See other specific restrictions – Yes for salmon, steelhead, bull trout – check timing table for other priority species	Swimming restriction during treatment, and for 24-hours post-treatment (in the treated area)	None	Do not use in salmon-bearing waters.

Active Ingredient	Subject to Timing	Restrictions/ Advisories	Treatment Limitations	Other Specific Restrictions
<i>Bispyribac-sodium</i>	No for fish - check timing table for other priority species.	None	None	None
<i>Carfentrazone-ethyl</i>	Yes for salmon, steelhead, bull trout –check timing table for other priority species	None	None	None
<i>Diquat</i>	Yes for salmon, steelhead, bull trout –check timing table for other priority species	Swimming advisory during treatment, and for 24-hours post-treatment (in the treated area)	<ul style="list-style-type: none"> ➤ Do not pour Diquat directly from the container into the water body. ➤ Do not apply to emergent shoreline vegetation (e.g., cattails, bulrush) 	Consult FIFRA product label for water use restrictions.
<i>Endothall (dipotassium salt)</i>	Yes for salmon, steelhead, bull trout – check timing table for other priority species	Swimming advisory during treatment, and for 24-hours post-treatment (in the treated area)	Do not apply within 400 ft of an outlet stream if there is an outflow.	Consult FIFRA product label for water use restrictions.

Active Ingredient	Subject to Timing	Restrictions/ Advisories	Treatment Limitations	Other Specific Restrictions
Endothall (mono salt)	Yes for salmon, steelhead, bull trout –check timing table for other priority species	Swimming advisory during and for 24-hours after treatment (in the entire water body)	<ul style="list-style-type: none"> ➤ Use for control of filamentous algae, cyanobacteria, or harmful algae only. See S1.A.2(b) ➤ Limit concentrations to 0.2-mg/L of active ingredient 	<ul style="list-style-type: none"> ➤ Treatment must occur from the shoreline outward into the water body. ➤ Consult FIFRA product label for water use restrictions.
Flumioxazin	Yes for salmon, steelhead, bull trout –check timing table for other priority species	None	None	None
Fluridone	No for fish - check timing table for other priority species.	None	Ecology further limits fluridone application to no more than 50 percent of the littoral zone in lakes up to 50 acres and no more than 40 percent of the littoral zone in lakes from 50 - 500 acres.	None
Glyphosate	No for fish - check timing table for other priority species.	None	None	None

Active Ingredient	Subject to Timing	Restrictions/ Advisories	Treatment Limitations	Other Specific Restrictions
<i>Imazapyr</i>	No for fish - check timing table for other priority species.	None	None	None
<i>Imazamox</i>	No for fish - check timing table for other priority species.	None	None	None
<i>Penoxsulam</i>	No for fish - check timing table for other priority species.	None	None	None
<i>Sodium carbonate peroxyhydrate</i>	No for fish - check timing table for other priority species.	Swimming advisory during treatment, and for 2-hours post-treatment (in the treated area)	Do not treat plants growing on the shore.	None
<i>Triclopyr TEA</i>	No for fish - check timing table for other priority species.	Swimming advisory during treatment, and for 12-hours post-treatment (in the treated area)	Aerial applications are not allowed.	Consult FIFRA product label for water use restrictions.

Table 4: Specific Restrictions on Application of Products for Inactivation of Phosphorous

Phosphorous Inactivation Products	Subject to Timing	Restrictions/ Advisories	Treatment Limitations	Other Specific Restrictions
Alum	<ul style="list-style-type: none"> ➤ No for fish - check timing table for other priority species. ➤ Timing should address aquatic plant biomass that may interfere with inactivation of sediment phosphorous (requiring early spring or fall treatment). 	None	<ul style="list-style-type: none"> ➤ Application must cease when wind speed is greater than 15 miles per hour ➤ Powdered alum must be mixed with water to form a slurry before applying to the water surface. ➤ The pH of lake water during treatment must remain between 6.0 and 8.5 based on lake average. ➤ Only aluminum compounds suitable for water treatment may be used. ➤ Buffering materials must be available for use. 	<ul style="list-style-type: none"> ➤ A jar test must be completed prior to whole lake treatments only if a buffer other than sodium aluminate is used or a ratio of liquid alum to liquid sodium aluminate differs from 2:1 by volume. ➤ An on-site storage facility is required for any treatment requiring 9,000 gallons of alum or more, or the project proponent must have a plan to store any unused alum or buffering products. ➤ Follow the monitoring requirements in S6.B.
Calcium Products	No for fish - check timing table for other priority species.	None	The pH must remain between 6.0 and 9.0.	<ul style="list-style-type: none"> ➤ A jar test must be completed prior to treatment to identify proper dosing levels. This jar test needs to be conducted at least over a 24-hour period to ensure that the pH response is at equilibrium with water chemistry. ➤ Follow the monitoring requirements in S6.B.

Note: The products listed above are not registered as pesticides through FIFRA. A licensed applicator is not needed for the application of any of these products to waters of the United States.

Table 5: Restrictions on Applications of Shading Products and Biological Water Clarifiers

Product	Restrictions
Shading products	Do not apply directly to rivers or streams or any lake that discharges to other surface waters of the state.
Biological Water Clarifiers	Use only in water bodies with no discharge to other surface waters of the state during and for two weeks after treatment.

Note: These restrictions are in addition to the federal FIFRA label requirements (when applicable).

S5. NOTIFICATION, INSPECTION, AND POSTING REQUIREMENTS

A. Ecology Notification Requirements

1. Pre- and post-treatment notification

The Permittee must email pre-and post-treatment information to Ecology, at apampreposttreat@ecy.wa.gov, each week that treatment occurs using the form in Appendix B. Ecology must receive the form no later than 8:00 am on each Monday. For unforeseen events, the Permittee may *occasionally* provide Ecology with less notice so long as pre-treatment notification occurs at least two days prior to the treatment.

2. Adverse incidents or spills

The Permittee must immediately call the appropriate Ecology regional contact and Ecology headquarters or 1-800-645-7911 when they are made aware of any of the following conditions occurring during or after a treatment:

- a. Any person(s) exhibiting or indicating any toxic and/or allergic response as a result of the treatment.
- b. Any fish or fauna exhibiting stress or dying inside or outside of the treatment area.
- c. Any spill of chemicals covered under this permit that occurs into the water or onto land with a potential for entry into waters of the state.

B. Ecology Inspection Coordination Requirements

1. At Ecology's request, each Permittee must coordinate and schedule inspections with Ecology staff. The location and starting time for the scheduled inspection must be on record in writing at Ecology.
2. For scheduled inspections, the Permittee must not apply chemicals until Ecology staff is present, unless they do not arrive within 30 minutes of the scheduled start time.

C. Residential and Business Notification

1. Using the template on the permit webpage, the Permittee must provide Residential and Business Notice (notice) to all waterfront residences and businesses within one-quarter mile in each direction along the water body shoreline or across the water

from proposed treatment areas.

2. The Permittee may provide the notice by mail, newsletter, or handbills delivered directly to the residences or businesses.
3. This permit does not authorize trespass or damage to property as a result of providing business and residential notices.
4. Businesses and residents must receive the notice at least 10 days in advance and at most 42 days before the first treatment of each year. If the notice explains the **application schedule** for the entire treatment season and there is no deviation from that schedule (with an exception for cyanobacteria treatment), Ecology requires no further notice for the rest of the treatment season. On water bodies with a history of cyanobacterial blooms, the Permittee may explain in the notice that algae treatment may occasionally occur outside of the scheduled time periods without prior notice depending on bloom conditions. The Permittee must provide additional notification to any resident or business that specifically requests further notification of treatment dates.
5. Business and residential notices for permit coverages in Water Resource Inventory Areas 7 (Snohomish), 8 (Cedar/Sammamish), and 9 (Duwamish/Green) (<http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm>) must be sent to Nancy.Rapin@muckleshoot.nsn.us and Karen.Walter@muckleshoot.nsn.us. In the event that the email contacts become out-of-date Ecology will provide updated contact information.
6. The Permittee must email to Ecology, at apampreposttreat@ecy.wa.gov, a copy of the notice, the date of distribution, and a list of addresses that the notice was delivered to, no later than one business day following public distribution. The Permittee must email a copy of the notice, including the date of distribution, to the Department of Natural Resources (DNR at Todd.Brownlee@dnr.wa.gov no later than one business day following public distribution. The Permittee need not notify DNR for treatments occurring on privately-owned lakes with no public access.
7. Ecology does not require business and residential notice for applications made to limited access highways, fenced wetland mitigation sites, or other facilities where no **reasonable public access** exists and there are no potable water intakes. When applications are made to waters with no reasonable public access and no potable water intakes, Permittees must provide Ecology with a copy of the treatment notice as required in Special Condition S5.C.6.

D. *Shoreline Recreational Facilities Notification Requirements*

1. Permittees must notify the facility manager when a pesticide application will occur in or within 400 feet of a facility's swimming area or recreational area.
2. Notification must occur at least 10-42 days prior treatment.
3. Facility notification must include the name of the product being applied, the time period during which treatment will occur, any drinking, swimming or recreational advisories or restrictions, and Permittee contact information.
4. Notification to the shoreline recreational facility manager is not required when notification to the shoreline recreational facility manager was provided through the business and residential notice (S5.C).

E. *Shoreline Posting Requirements*

1. General Requirements for Posting Shorelines

The Permittee must:

- a. Use templates provided on the permit webpage.
- b. Post signs no more than 48 hours prior to treatment.
- c. Post signs so that they are secure from the normal effects of weather and water currents.
- d. Make best efforts to ensure that the signs remain in place and are legible until the end of the period of water use restrictions.
- e. Remove all old signs at the end of the period of water use restriction.

If applying more than one chemical in an area, the Permittee may list all chemicals on the sign, but must use the template and restrictions for the chemical with the most stringent water use restrictions.

If the majority of the affected community speaks a language other than English, the Permittee may use online translation websites to make signs for these communities.

For continuous injection treatments for phosphorous inactivation projects, the Permittee does not need to post the lake.

Ecology does not require shoreline posting in areas where public access is limited to boat only access and there are no private residents.

2. Posting ***Privately or Publicly-Owned Shoreline*** Areas (excluding ***public access areas***) with 8 ½ by 11 Inch Signs
 - a. The Permittee must post signs at each waterfront private residence or business property that is within 400 feet of a treated area.
 - b. The Permittee must post the signs to face both the water and the shore and site them where they are most visible to residents (within approximately ten feet of the shoreline). The Permittee must post one sign for approximately every 100 feet of shoreline.
 - c. If the shoreline is only accessible by entering through a gate, the Permittee may post a sign at each gate that allows access to, or is within 400 feet of a treated area. The Permittee does not need to post additional signs.
3. Posting Shoreline ***Public Access Areas*** with Two Foot by Three Foot Signs
 - a. The Permittee must post signs at all public access areas on the water body that are within 400 feet of a treated area and at all ***public boat launches*** on the water body within one quarter mile of a treated area.
 - b. The Permittee must site the signs so that they are clearly visible to people using the public access area, spacing the signs approximately every 100 feet of shoreline and within approximately 25 feet of the shoreline. Signs must face both the water and the shore. At public boat launches, signs need only face the shore.
 - c. If a public shoreline is only accessible by entering through a gate, the Permittee may post a sign at each gate that allows access to, or is within 400 feet of a treated area. The Permittee does not need to post additional signs.
 - d. Signs must be a minimum size of two feet by three feet and constructed of durable weather-resistant material. The Permittee must attach an 8 ½ by 11 inch weather resistant map detailing the treatment areas for each chemical used. The map must identify the location(s) of the treatment site(s), identify addresses or parcels that represent the start and end points of the treatment area or provide gps coordinates that represents the corners of the treatment area polygon and mark the reader's location. If the Permittee applies more than one chemical, it must mark each treated area and appropriate chemical on the map.

Signs must:

- i. Include the word “CAUTION” in bold black type at least two inches high.
 - ii. Use a font at least ½ inches high for all other words.
4. Posting ***Public Pathways*** Along a Treated Water body
 - a. The Permittee must post two foot by three foot signs at ***public entrances*** to public pathways that allow reasonable direct access to the water body and that are within 400 feet of a treated area.
 - b. The Permittee must post 8 ½ by 11 inch signs at approximately 100 foot intervals along the pathway along any treated areas and within 400 feet of any treated areas.
5. Posting for Roadside/Ditch Bank Aquatic Applications
 - a. The Permittee does not need to post signs for roadside applications or applications to areas with no reasonable public access.
 - b. For those sites with public access areas, the Permittee must:
 - i. Post signs no more than 48 hours before an application.
 - ii. Place signs at any boat launch within 1/4 mile of any treated area. Signs must be within 25 feet of the shoreline, facing both the water and shore.
 - c. The Permittee is responsible for the removal of all signs at the end of each treatment season, but may use biodegradable sign material so that removal is not necessary.
6. This permit does not authorize trespass or damage to property from posting of shoreline signs or notices.

S6. MONITORING REQUIREMENTS

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

All samples must be analyzed by a laboratory registered or accredited under the provisions of *Accreditation of Environmental Laboratories*, Chapter 173-50 WAC. The following parameters need not be accredited or registered:

1. Flow.
2. Temperature.
3. Settleable solids.
4. Conductivity, except that conductivity must be accredited if the laboratory must otherwise be registered or accredited.
5. pH, except that pH must be accredited if the laboratory must otherwise be registered or accredited.
6. Turbidity, except that turbidity must be accredited if the laboratory must otherwise be registered or accredited.
7. Parameters which are used solely for internal process control

Documentation of monitoring activities and results must include (if applicable):

1. The date, exact place, and time of sampling.
2. The date analyses were performed.
3. Who performed the analyses.
4. The analytical techniques/methods used (if any).
5. The results of such analyses.

A. Application of Herbicides and Algaecides

The Permittee must monitor dissolved oxygen levels pre- and post-treatment when contact herbicides are used in water bodies on the 303(d)-list for dissolved oxygen.

1. Immediately before treating, the Permittee must monitor surface and bottom dissolved oxygen concentrations at a sampling location in the center and at the edge of the proposed treatment area(s). The Permittee must select at least one representative treatment area to monitor each time the water body is treated.
2. The Permittee must monitor post-treatment surface and bottom dissolved oxygen concentrations no earlier than seven days and no later than 14 days after the treatment, at the *same time of day* that the pre-treatment monitoring occurred and at the same sites and depths.
3. The Permittee must submit these data to the Ecology permit manager no later than 30 days after the post-treatment monitoring date.

B. Application of Phosphorous Inactivation Products

1. Aluminum sulfate or sodium aluminate (alum).
 - a. The monitoring requirement for whole or partial lake treatments is:
 - i. One surface water pH measurement in the morning prior to any alum addition and one surface water pH measurement one hour after alum addition has stopped for that day.
 - ii. The Permittee must monitor pH for the duration of the treatment and for 24 hours following treatment completion. The monitoring

location must be representative of water body-wide conditions. If the pH decreases to less than 6.2, the Permittee must stop the treatment, analyze for alkalinity, and take immediate steps to increase the pH.

- b. For continuous injection treatments, the Permittee must measure pH at a minimum once every two weeks during the first month of continuous injection and thereafter once a month for the duration of the injection process. The Permittee must ensure that pH measurements represent water body-wide conditions, unless the injection system is in an isolated area in relation to the main water body (e.g., in a bay with a narrow channel to the main water body). For isolated areas of water bodies, the Permittee must measure pH at the end of the bay and in the main water body.

2. Calcium hydroxide/oxide or calcium carbonate treatment

- a. The Permittee must measure pH once on the day before treatment, once in the morning prior to treatment and once in the afternoon after treatment has stopped for the day, for the duration of the treatment and for 24 hours following treatment. If the pH is above 9.0 due to the effects of the treatment (rather than through photosynthesis), the Permittee must stop treatment.
- b. For continuous injection systems, the Permittee must measure pH at a minimum once every two weeks during the first month of continuous injection and thereafter once a month for the duration of the injection process. The Permittee must ensure that pH measurements represent water body-wide conditions, unless the injection system is in an isolated area in relation to the main water body (e.g., in a bay with a narrow channel to the main water body). For isolated areas of water bodies, the Permittee must measure pH at the end of the bay and in the main water body.

S7. REPORTING AND RECORDKEEPING REQUIREMENTS

Ecology is making changes to its online permit application and annual reporting system and, when complete, may modify this permit to account for the changes.

The Permittee must submit pesticide/product application information in accordance with the following conditions.

A. Annual Treatment/Monitoring Reports

1. By December 31 of each year, the Permittee must submit its Annual Treatment and Monitoring Report electronically through Ecology's online data management system (SecureAccess Washington at <https://secureaccess.wa.gov>). A signed and dated copy of the report must be mailed to:

Department of Ecology
Water Quality Program
Attn: Aquatic Pesticide Permit Manager
P.O. Box 47600
Olympia, WA 98504-7600

2. The Permittee must submit an annual treatment/monitoring report regardless of whether a treatment or monitoring occurred. The report must include: Water body name, chemicals used, amount of active ingredient applied in pounds, acreage treated, monitoring results, and the plant species targeted.
3. The Permittee must submit any dissolved oxygen monitoring data to the Aquatic Pesticide Permit Manager and the appropriate regional contact, no later than 30 days after the post-treatment monitoring date.

B. Records Retention

1. The Permittee must retain records of all permitting and monitoring information for a minimum of five (5) years. Such information must include copies of all reports required by this permit, plant surveys, and records of all data used to complete the application for this permit.
2. The Permittee must keep records longer in the event of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.
3. The Permittee must make the records, reports, surveys, plans, public notices (including a list of locations or addresses to which they were delivered), and other information required by this permit available to Ecology upon request.

C. Recording of Results

For each measurement or sample taken, the Permittee must follow the recording provisions outlined in WAC 173-226-090 (2).

D. Noncompliance Notification

Compliance with the requirements of this special condition does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failing to comply.

In the event the Permittee is unable to comply with any part of this permit, which may threaten human health or the environment, the Permittee must:

1. Immediately take action to minimize potential pollution or otherwise stop the noncompliance and correct the problem.
2. Immediately notify the appropriate Ecology regional office and the aquatic pesticides permit manager of the failure to comply via the regional spills telephone hotline and the aquatic pesticides permit manager's phone number below.

Central (CRO) -----	509-575-2490
Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, and Yakima counties	
Eastern (ERO) -----	509-329-3400
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, and Whitman counties	
Northwest (NWRO) -----	425-649-7000
Island, King, Kitsap, San Juan, Skagit, Snohomish, and Whatcom counties	
Southwest (SWRO) -----	360-407-6300
Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, and Wahkiakum counties	
Aquatic Pesticide Permit Manager -----	(360) 407-6600

3. The Permittee must provide a written report to Ecology within five (5) days of the time that the Permittee becomes aware of any permit non-compliance unless Ecology requests and earlier submission. The report must contain a description of the noncompliance and its cause, the exact date(s), time(s), place(s), and duration(s) of the noncompliance, whether the noncompliance has been corrected and, if not, when the noncompliance will be corrected, and the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

Upon request of the permittee, Ecology may waive or extend the requirement for a written report on a case-by-case basis, if the immediate notification (S7.D.2) is received by Ecology within 24 hours.

4. The Permittee must submit noncompliance notifications to:

Washington State Department of Ecology
 Water Quality Program
 Attn: Aquatic Pesticide Permit Manager
 PO Box 47696
 Olympia, WA 98504-7696

S8. SPILL PREVENTION AND CONTROL

A. Spill Prevention

The Permittee must:

1. Handle, store, and use all oil, fuel, chemicals, or products authorized under this permit in a manner that prevents spills.
2. Ensure that it maintains all mobile equipment to prevent leaks or spills of petroleum products.
3. Have absorbent materials available for cleanup or the spill containment materials recommended in the Material Safety Data Sheet for that product, including appropriate cleanup materials for a spill of the products being applied.

B. Spill Notification Requirements

The Permittee must immediately report spills to Ecology by calling 1-800-645-7911. See <http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm> for more environmental reporting information.

C. Spill Cleanup Requirements

1. In the event of a spill, the Permittee must begin immediate containment and cleanup using appropriate materials. Cleanup takes precedent over normal work.
2. Cleanup includes proper disposal of any spilled materials and used cleanup materials.

S9. MITIGATION FOR PROTECTION OF SENSITIVE, THREATENED, OR ENDANGERED PLANTS

A. Survey Requirements

If Ecology notifies the Permittee that a rare plant species (rare plant) is reported to be present in a proposed treatment area, the Permittee must conduct a detailed plant survey (unless Ecology waives this requirement).

1. The survey must be performed by a *botanist*. The person conducting the survey must not have a financial or personal interest in the treatment.
2. The botanist must survey when plants are present and can be positively identified, but no earlier than three months before treatment. Ecology may waive the three

month requirement if the plant cannot be positively identified during that time frame.

3. The survey must cover 100% of the waterbody habitat that is identified as suitable for the rare plant of concern.
4. The Permittee must survey each year before treatment for rare submersed, floating, or floating-leaved plants and once every five years for rare emergent shoreline plants.
5. The Permittee must submit the survey data to Ecology no later than thirty days before treatment. Permittees must submit a map of the location of the rare plant(s) if the survey identifies rare plants. Ecology may modify or suspend the annual survey requirement if it determines that the treatment(s) have had no adverse effect on the rare plant population.

B. Mitigation

1. When a rare plant is not found, as a result of the plant survey, in the treatment area; the permittee must use the lowest effective concentration of herbicide for the target plant and use a selective herbicide (if applicable) or an herbicide demonstrated to have little effect on the rare plant.
2. When a rare plant is found in the treatment area, the Permittee must apply prescribed buffers (where required) and select one or more mitigation choices listed below to minimize treatment impacts to the rare plant. Monitoring the vitality of rare plant populations after treatment may be required by Ecology. The Permittee must not allow treatment to affect the viability of the rare plant population.
3. Mitigation measures for:
 - a. Submersed, floating, or floating-leaved plants: If the rare plant is submersed, floating, or floating-leaved and the herbicide application is intended to control submersed species, the Permittee must maintain a no-treatment buffer around the rare plants. The Permittee must maintain a 100-foot buffer when using contact herbicides and must consult with Ecology when using systemic herbicides to determine appropriate buffer distances. If the Permittee has difficulty maintaining a buffer from the majority of the rare plant population, it must consult with Ecology for other options (e.g., physically relocating the plants).

In addition to the buffer, the Permittee must choose one or more mitigation measures below:

- i. Use a selective herbicide (if applicable) or an herbicide demonstrated to have little effect on the rare plant.
 - ii. Use the lowest effective concentration of herbicide for the target plant if the Permittee can demonstrate that the rare plant is tolerant to the herbicide at that concentration.
 - iii. Use barriers or containment structures (e.g. silt curtains) to protect the rare plant.
 - iv. For floating rare plants, temporarily relocate the plants to an untreated area.
 - v. Time the treatment during the growing season to prevent impacts to the rare plant.
- b. Emergent plants: If the rare plant is emergent or floating-leaved and the targeted plants are being treated above the water (i.e., target plants are emergent), the Permittee must maintain a no treatment buffer of 10 feet from the rare plant and choose one or more of the following mitigation measures:
- i. Use a selective herbicide (if applicable) or an herbicide demonstrated to have little effect on the rare plant.
 - ii. Select an application technique designed to cause less non-target damage (e.g., low-drift nozzle heads, wiper applications, sponge bars, temporarily covering the rare species, etc.).
 - iii. Time the treatment during the growing season to prevent impacts to the rare plant.

S10. APPENDICES

The attached appendices are incorporated by reference into this permit.

APPENDIX A - DEFINITIONS

APPENDIX B - ECOLOGY NOTIFICATION TEMPLATE

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to Ecology must be signed and certified.

- A. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - 1. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision making functions for the corporation, or
 - 2. The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- B. In the case of a partnership, by a general partner.
- C. In the case of sole proprietorship, by the proprietor.
- D. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.
- E. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - 1. The authorization is made in writing by the person described above and is submitted to Ecology at the time of authorization, and
 - 2. The authorization specifies either a named individual or any individual occupying a named position.
- F. Changes to authorization. If an authorization under paragraph E above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.
- G. Any person signing a document under this section must make the following certification:

“I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

G2. RIGHT OF ENTRY AND INSPECTION

Representatives of Ecology must have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state.

Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection.

Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample any discharge, waste treatment processes, or internal waste streams.

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology’s initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

- A. The following are causes for terminating permit coverage during its term, or for denying a permit renewal application:
1. Violation of any permit term or condition.
 2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
 3. A material change in quantity or type of waste disposal.
 4. A determination that the permitted activity endangers human health or the environment or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination [40 CFR part 122.64(3)].

5. A change in any condition that requires either a temporary or permanent reduction or elimination of any discharge or sludge use or disposal practice controlled by the permit [40 CFR part 122.64(4)].
 6. Nonpayment of fees assessed pursuant to RCW 90.48.465.
 7. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.
- B. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:
1. A material change in the condition of the waters of the state.
 2. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
 3. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
 4. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
 5. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
 6. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
 7. Incorporation of an approved local pre-treatment program into a municipality's permit.
- C. The following are causes for modification or alternatively revocation and reissuance:
1. Cause exists for termination for reasons listed in A1 through A7, of this section, and Ecology determines that modification or revocation and reissuance is appropriate.
 2. Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING PLANNED CHANGES, CAUSE FOR MODIFICATION

The Permittee must, as soon as possible, but no later than sixty (60) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

- A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
- B. A significant change in the nature or an increase in quantity of pollutants discharged.
- C. A significant change in the Permittee's sludge use or disposal practices.

Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with WAC 173-240. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit must be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology. This permit is automatically transferred to a new owner or operator if:

- A. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
- B. A copy of the permit is provided to the new owner and;
- C. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to section A. above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludge, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. PAYMENT OF FEES

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under WAC 173-224 are not paid.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof will be punished by a fine of up to ten thousand dollars (\$10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs is a separate and additional violation. Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil

penalty in the amount of up to ten thousand dollars (\$10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. UPSET

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met. A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in condition S5.A; and 4) the Permittee complied with any remedial measures required under S9.D of this permit. In any enforcement proceedings the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit will, upon conviction, be punished by a fine of not more than \$10,000 per

violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this Condition, punishment will be a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. REPORTING ANTICIPATED NON-COMPLIANCE

The Permittee shall give advance notice to Ecology by submission of a new application, or supplement to the existing application, at least 45 days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during non-critical water quality periods and carried out in a manner approved by Ecology.

G22. DUTY TO REAPPLY

The Permittee must reapply for coverage under this general permit at least one hundred and eighty (180) days prior to the specified expiration date of this general permit. An expired general permit and coverage under the permit continues in force and effect until Ecology issues a new general permit or until Ecology cancels it. Only those Permittees that reapply for coverage are covered under the continued permit.

APPENDIX A – DEFINITIONS

All definitions listed below are for use in the context of this permit only.

303(d): Section 303(d) of the federal Clean Water Act requires states to develop a list of polluted water bodies every two years. For each of those water bodies, the law requires states to develop Total Maximum Daily Loads (TMDLs). A TMDL is the amount of pollutant loading that can occur in a given water body (river, marine water, wetland, stream, or lake) and still meet water quality standards.

2,4-D Ester: 2,4-Dichlorophenoxyacetic acid, butoxyethyl ester.

2,4-D Amine: 2,4-Dichlorophenoxyacetic acid, dimethylamine salt.

Adjuvant: An additive, such as a surfactant, that enhances the effectiveness of the primary chemical (active ingredient).

Algae: Primitive, chiefly aquatic, one-celled, or multicellular plant-like organisms that lack true stems, roots, and leaves but usually contain chlorophyll.

Algaecide: A chemical compound that kills or reduces the growth of algae or cyanobacteria.

Algae control: Applying algaecide products to kill or suppress the growth of cyanobacteria, filamentous algae, or any algal species that have the potential to affect human or environmental health.

All known, available, and reasonable methods of pollution control, prevention, and treatment (AKART): A technology-based approach to limiting pollutants from discharges. Described in chapters 90.48 and 90.54 RCW and chapters 173-201A, 173-204, 173-216 and 173-220 WAC.

Applicant: The licensed pesticide applicator or state or local government entity choosing to get coverage under this permit. For phosphorous inactivation projects the applicant does not need to be a licensed applicator but may be a government entity or the person that discharges the product.

Application schedule: The proposed treatment date(s) for a specific water body or specific area within a water body during one treatment season.

Applicator: The person that discharges the chemical to a water body. Applicators are required to be licensed to apply registered pesticides. Some chemicals such as alum are not registered or used as pesticides and therefore the applicator does not, by state law, have to be licensed.

Aquatic nuisance plants: Any non-noxious aquatic plants that are at a density and location so as to substantially interfere with or eliminate some beneficial uses of the water body. Typically these beneficial uses include activities such as boating, swimming, fishing, or waterskiing.

Aquatic plant control: The partial removal of aquatic plants within a water body or along a shoreline to allow for the protection of beneficial uses of the water body.

Biological water clarifiers: Microbial or bacterial products sold for the purpose of water clarification, removal of organic materials from sediment, and reduction of nutrients (as claimed by manufacturers).

Bispyribac-sodium: Sodium, 2,6-bis [(4,6-dimethoxy-pyrimidin-2-yl)oxy] benzoate.

Blooms: A high density or rapid increase in abundance of algae (cyanobacteria).

Botanist: A scientist that specializes in the study and identification of plants, or an individual with education and experience in the identification of plant species.

Carfentrazone-ethyl: Ethyl a,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate.

Constructed water body: A man-made water body created in an area that was not part of a previously existing watercourse, such as a pond, stream, wetland, etc.

Contact herbicide: An herbicide that typically affects only the part of the plant that the herbicide is applied to. Contact herbicides often act as chemical mowers, leaving roots available for re-growth. Contact herbicides are fast-acting, but tend to result in temporary removal of the targeted plants.

Control: The partial removal of native plants, non-native non-noxious plants, algae, and noxious or quarantine-list weeds (that are not being eradicated lake-wide) from a water body. The purpose of control activities is to protect some of the beneficial uses of a water body such as swimming, boating, water skiing, fishing access, etc. The goal is to maintain some native aquatic vegetation for habitat while allowing some removal for beneficial use protection.

Cyanobacteria: A group of usually unicellular photosynthetic organisms without a well-defined nucleus; sometimes called "blue-green algae" although they are not actually algae. Some genera of cyanobacteria produce potent liver or nerve toxins.

Defined navigation channels: Clearly delineated areas that are intended to provide safe access to different sections of the water body by boat.

Detention or retention ponds: Man-made water bodies specifically constructed to manage stormwater. Detention ponds are generally dry until a significant storm event. Retention (wet) ponds are designed to have a permanent pool of water and gradually release stormwater through

an outlet.

Diquat: Dibromide salt of 6,7-dihydrodiprido (1,2-a:2',1''-c) pyrazinediium.

Direct supervision responsibilities: Licensed certified applicators may directly supervise unlicensed applicators. Direct supervision by aquatic certified applicators means direct on-the-job supervision and requires that the certified applicator be physically present at the application site and that the person making the application be in voice and visual contact with the certified applicator at all times during the application (RCW 17.21).

Emergent vegetation: Aquatic plants that generally have their roots in the water, but the rest of the plant is above water (e.g., cattails, bulrush).

Endothall Dipotassium Salt: Dipotassium salt of 7-oxabicyclo[2.2.1]heptane-2,3dicarboxylic acid.

Endothall Mono Salt: mono(N,N-dimethylalkylamine) salt of 7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid.

Farm pond: Private farm ponds created from upland sites that did not incorporate natural water bodies (WAC 173-201A-260(3)(f)).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA): A set of EPA regulations that establishes uniform pesticide product labeling, use restrictions, and review and labeling of new pesticides.

Filamentous algae: Typically green algae species that grow in long strings or form cloud-like mats in water. Filamentous algae do not produce toxins.

Floating-leaved plants: Plants that are rooted in the sediment but have leaves floating on the water's surface (e.g., water lilies).

Flumioxazin: 2-[7-fluro-3,4-dihydro-3-oxo-4-(2-propynyl)-2H-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-isoindole-1,3(2H)-dione.

Fluridone: 1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone.

Glyphosate: N-(phosphonomethyl)glycine, isopropylamine salt.

Herbicide: Any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any weed or other higher plant (see chapter 17.21.020 RCW).

High use areas: Any areas that get a high level of human use. Examples include community and public boat launches, marinas, public or community swim beaches, and canals.

Identified and/or emergent wetlands: Identified wetlands are those identified by either local, state, or federal agencies as being important wetlands. Emergent wetlands (marshes) are characterized by plants growing with their roots underwater and leaves extending above the water (emergent plants).

Imazamox: 2-[4,5-dihydro-4-methyl-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid.

Imazapyr: 2-(4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl)-3-pyridinecarboxylic acid.

Indian Country: Means as defined in 18 USC 1151: “Except as otherwise provided in sections 1154 and 1156 of this title, the term “Indian country”, as used in this chapter, means (a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.”

Individual treatments: Treatments done at the request of an individual owner under a permit coverage specific to that property only.

Intentionally apply: The permit allows the applicator to directly discharge an herbicide, algaecide, or other product identified in this permit into areas designated for treatment (e.g., via hoses, granular pellets, etc.). Note that products applied directly to the water may disperse outside of the boundaries of the treated area.

Levees and dikes: Typically earth structures (dams) that keep elevated water levels from flooding interior lowlands.

Licensed pesticide applicator: Any individual who is licensed as a commercial pesticide applicator, commercial pesticide operator, public operator, private-commercial applicator, demonstration and research applicator, or certified private applicator, or any other individual who is certified by the director of WSDA to use or supervise the use of any pesticide which is classified by the EPA as a restricted use pesticide or by the state as restricted to use by certified applicators only. WSDA classifies aquatic herbicides as restricted use pesticides.

Littoral zone: The vegetated area from the water body’s edge to the maximum water depth where plant growth occurs. The littoral zone varies between water bodies depending on bathymetry, water clarity, water quality, and other environmental conditions.

Lot: A parcel of land having fixed boundaries.

Marker dyes: Colorants that are sprayed onto the targeted weed along with the herbicide. Marker dyes allow better targeting of herbicide sprays since treated and untreated areas are more clearly seen by the applicator.

Municipal or community drinking water intakes: A drinking water intake that supplies water to a city, town, or a community.

Notice of Intent: An application to obtain coverage under an NPDES permit.

Noxious Weed: Means a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices (RCW 17.10.010(1)). The Washington State Noxious Weed Control Board maintains the list of noxious weeds in WAC 16-750-005, 16-750-011, and 16-750-015. Noxious weeds may also include: Plants listed on the quarantine list as identified in chapter 16-752-610 WAC. Non-native and potentially invasive plants not listed on the above lists, as determined by the Washington State Noxious Weed Control Board, the Washington State Department of Agriculture (WSDA), or the Washington State Department of Ecology (Ecology).

Occasionally: No more than a few times (1-3) per treatment season and only for unforeseen events (e.g., disruption with product deliveries or severe adverse weather conditions).

Penoxsulam: 2-(2,2-difluoroethoxy)--6-(trifluoromethyl-N-(5,8-dimethoxy[1,2,4] triazolo[1,5-c]pyrimidin-2-yl)) benzenesulfonamide.

Permittee: The licensed applicator or government entities that have obtained coverage under the permit. For phosphorous inactivation projects, the Permittee may be the discharger that most closely resembles a licensed applicator.

Pesticide: WAC 15.58.030 (31) "Pesticide" means, but is not limited to:

- a) Any substance or mixture of substances intended to prevent, destroy, control, repel, or mitigate any insect, rodent, snail, slug, fungus, weed, and any other form of plant or animal life or virus, except virus on or in a living person or other animal which is normally considered to be a pest or which the director may declare to be a pest;
- b) Any substance or mixture of substances intended to be used as a plant regulator, defoliant or desiccant; and
- c) Any spray adjuvant.

Phosphorous inactivation products: Products used to inactivate nutrients in the sediments include aluminum sulfate or sodium aluminate (alum) and calcium hydroxide.

Private property: Any property owned by a single person or multiple persons or business that provides no public access to a water body.

Priority habitats and species: Habitats and species that WDFW considers priorities for conservation and management in Washington. Priority species require protective measures for their survival due to their population status, sensitivity to habitat alternation, and/or recreational, commercial or tribal importance. Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species.

Privately or publicly-owned shoreline: Any shoreline area **without public access**, owned by an individual, business, or a public entity.

Public access: Identified legal passage to any of the public waters of the State, assuring that members of the public have access to and use of public waters for recreational purposes. Public access areas include public- or community-provided swimming beaches, picnic areas, docks, marinas, and boat launches at state or local parks and private resorts.

Public access areas: These areas include public- or community-provided swimming beaches, picnic areas, docks, marinas, and boat launches at state or local parks and private resorts.

Public boat launch: A public- or community-provided location on a water body that is designated for the purpose of launching or placing a boat in the water, usually for recreational purposes. Boat launches also include sites used as put-ins and take-outs for small watercraft such as canoes or kayaks.

Public entrance: A location where people typically access a public pathway.

Public pathway: A trail along a water body that allows access to the water body by the public.

Quarantine-listed weeds: Plants listed on the WSDA Quarantine list as identified in chapter 16.750 WAC.

Reasonable public access: Identified legal passage to any of the public waters of the State, or areas where it is apparent that the public have been accessing the water (well-worn pathways or other indications of recent human usage of the site).

Recreation: Water skiing, boating, swimming, wading, fishing, and other such water-related activities.

Right-of-way: A strip of land that is granted, through an easement or other mechanism, for transportation or other typically public uses. Right of way locations may include roadsides and/or highways, railroads, power lines and irrigation ditches.

Same time of day: The same two-hour time window for pre- and post-treatment monitoring on any given day (applies to pH and dissolved oxygen monitoring).

Selective herbicide: An herbicide that kills or affects specific plant species, sparing other less-susceptible species. Selectivity occurs through different types of toxic action or by the manner in which the material is used (its formulation, dosage, timing, placement, etc.).

Sensitive, threatened, or endangered plants:

Sensitive: Any species that is vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats.

Threatened: Any species likely to become endangered in Washington within the foreseeable future if factors contributing to its population decline or habitat degradation or loss continue.

Endangered: Any species in danger of becoming extinct or extirpated from Washington within the foreseeable future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

Shading products: These compounds are usually non-toxic dyes and are designed to reduce the amount of light penetrating the surface of a water body, thereby reducing plant and algae growth.

Shoreline: The area where water and land meet.

Shoreline Recreational Facilities: Means facilities located along a waterbody that provide water contact activities as part of an organized camp (e.g. children's camp through YMCA or other organization) and facilities where water contact activities are expected such as marinas, resorts, parks or other facilities actively managed for water contact recreation.

Sodium carbonate peroxyhydrate: $2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2$.

Sponsor: A private or public entity or a private individual with a vested or financial interest in the treatment. Typically the sponsor contracts with a licensed applicator to apply pesticides for aquatic plant or algae management. A sponsor is an individual or an entity that has authority to administer common areas of the water body or locations within the water body for the purposes of aquatic plant and algae management. Entities with this authority include Lake Management Districts formed under chapter 36.61 RCW, Special Purpose Districts formed under Title 57 RCW, Homeowners Associations formed under chapter 64.38 RCW, and groups operating under the provisions of chapter 90.24 RCW. There may be other entities with the authority to manage common areas in public or private water bodies. For treatment on individual lots, the sponsor must have the authority to contract for aquatic plant and algae management within the lot boundaries.

State experimental use permit: A permit issued by WSDA allowing use of pesticides that are not registered, or for experiments involving uses not allowed by the pesticide label. Aquatic applications are limited to one acre or less in size.

Submersed plants: Underwater. Submersed plants generally always remain under water, although many submersed species produce above-water flowers (e.g., pondweeds, milfoil).

Surface waters of the state of Washington: All waters defined as “waters of the United States” in 40 CFR 122.2 within the geographic boundaries of the state of Washington. All waters defined in RCW 90.48.020. This includes lakes, rivers, ponds, streams, inland waters, and all other fresh or brackish surface waters and water courses within the jurisdiction of the state of Washington. Also includes drainages to surface waters.

Swimming advisory: Information required to be posted on all public signs advising people not to swim in the treated area for a number of hours after treatment. An advisory is a recommendation rather than a restriction.

Swimming restriction: Information required to be posted on all public signs stating that no swimming must occur in the treatment area for a number of hours after treatment.

Systemic herbicide: A chemical that moves (translocates) throughout the plant and kills both the roots and the top part of the plant. Systemic herbicides are generally slower-acting than contact herbicides, but tend to result in permanent removal of the targeted plants.

Treatment: The application of an aquatic herbicide, algaecide, or control product to the water or directly to vegetation to control vegetation, algae, or remove or inactivate phosphorous.

Treated area: The area where pesticide is applied and where the concentration of the pesticide is sufficient to cause the intended effect on aquatic plants or algae.

Triclopyr TEA: Triethylamine salt of 3,5,6-trichloro-2-pyridyloxyacetic acid.

Trust or Restricted Lands: Means as defined in 25 USC 2201(4): “(i) “trust or restricted lands” means lands, title to which is held by the United States in trust for an Indian tribe or individual, or which is held by an Indian tribe or individual subject to a restriction by the United States against alienation; and (ii) “trust or restricted interest in land” or “trust or restricted interest in a parcel of land” means an interest in land, the title to which interest is held in trust by the United States for an Indian tribe or individual, or which is held by an Indian tribe or individual subject to a restriction by the United States against alienation.”

Washington Pesticide Control Act: Chapter 15.58 RCW.

Water right: A water right is a legal authorization to use a predefined quantity of public water for a designated use. The purpose must qualify as a beneficial use such as irrigation, domestic water supply, etc. Any use of surface water which began after the state water code was enacted in 1917 requires a water-right permit or certificate.

Wetland: Any area inundated with water sometime during the growing season, and identified as a wetland by a local, state, or federal agency.

In the absence of other definitions set forth herein, the definitions set forth in 40 CFR Part 403.3 or in chapter 90.48 RCW apply.

APPENDIX B – ECOLOGY NOTIFICATION TEMPLATE

See Special Condition S5.A for instructions on providing notification to Ecology.

Email Form

Email to: apamprepostreat@ecy.wa.gov

From: Permittee or Applicator: (name)

Cell Phone No: (contact number for the applicator)

Pre-Treatment Notification

Week of Treatment:

Water body name & permit no.	County	Location where treatment will begin	Chemicals/products proposed for use	Targeted plants & algae	Proposed date & treatment start time

Additional Information: _____

Post-Treatment Notification

Week of Treatment:

Water body name & permit no.	County	Chemicals or products used	Targeted plants/ algae	Acres treated	Amount of active ingredient applied (lbs.)	Treatment date

Additional Information: _____

Knowingly submitting false information will result in permit termination.

Permittee may add additional rows if needed

APPENDIX F

Shoreline Posting Template

CAUTION

The nutrient inactivation products aluminum sulfate and sodium aluminate will be applied under permit to these waters on March X through April XX, 2016.

There are no swimming or recreation restrictions.

For more information contact the applicator:
Contractor Business Name

Phone number: (xxx) xxx-xxx

Or the Department of Ecology at (360) 407-6600

THIS SIGN MUST REMAIN IN PLACE UNTIL 2 DAYS AFTER APPLICATION.



Scan with QR reader to go to permit web page

