Attachment E – Notice of Intent

WATER QUALITY ORDER NO. 2013-0002-DWQ
GENERAL PERMIT NO. CAG990005

STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item A. ☑ New Applicator B. ☐ Change of Information: WDID# _____ C. ☐ Change of ownership or responsibility: WDID# _____

II. DISCHARGER INFORMATION

A. Name **North Marin Water District**			
B. Mailing Address **999 Rush Creek Place**			
C. City **Novato**	D. County **Marin**	E. State **CA**	F. Zip **94948**
G. Contact Person **Robert Clark**	H. E-mail address **rclark@nmwd.com**	I. Title **Operations Superintendent**	J. Phone **415-761-8931**

III. BILLING ADDRESS (Enter Information ***only*** if different from Section II above)

A. Name			
B. Mailing Address			
C. City	D. County	E. State	F. Zip
G. E-mail address	H. Title	I. Phone	

IV. RECEIVING WATER INFORMATION

A. Algaecide and aquatic herbicides are used to treat (check all that apply):

1. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.
   Name of the conveyance system: _____
2. ☐ Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.
   Owner's name: _____
   Name of the conveyance system: _____
3. ☑ Directly to river, lake, creek, stream, bay, ocean, etc.
   Name of water body: **Lake Stafford**

B. Regional Water Quality Control Board(s) where treatment areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): **Region 2**
(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms: **Algae, submersed, floating, and emergent aquatic vegetation**

B. Algaecide and Aquatic Herbicide Used: List Name and Active ingredients

Copper (Algimycin® PWF)
Fluridone (Sonar Genesis®)
Hydrogen Peroxide/Dioxide (GreenClean Liquid 5.0®)
Peroxyacetic Acid (GreenClean Liquid 5.0®)
Sodium Carbonate Peroxyhydrate (PAK®27)
Triclopyr (Renovate®)

Note – product names listed in parentheses are examples only and may change.

C. Period of Application: Start Date: **January 1** End date: **December 31, for the life of the permit**

D. Types of Adjuvants Used: **Aquatic labeled adjuvants such as Liberate® and Competitor®, as needed**

VI. AQUATIC PESTICIDE APPLICATION PLAN

Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?
☑ Yes ☐ No

If not, when will it be prepared? _____

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified? ☑ Yes ☐ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?
☑ YES ☐ NO ☐ NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the 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 or imprisonment. Additionally, I certify that the provisions of the General Permit, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Tony Williams

B. Signature: _____ **Date:** 2/3/2023

C. Title: General Manager

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID:	**Date NOI Received:**	**Date NOI Processed:**
Case Handler's Initial:	**Fee Amount Received:** **$**	**Check #:**
☐ **Lyris List Notification of Posting of APAP**	**Date** _____	**Confirmation Sent** _____

Aquatic Pesticide Application Plan

North Marin Water District

WDID # 2 215031001

Aquatic Pesticide Application Plan (APAP)

For the

Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications

Water Quality Order No. 2013-0002-DWQ

General Permit # CAG990005

August 12, 2022

Prepared for:
North Marin Water District
999 Rush Creek Place
PO Box 146
Novato, CA 94948
Contact: Robert Clark
(415) 761-8931

Prepared by:
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1615 5th Street, Suite A
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Contact: Stephen Burkholder
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Submitted to:
State Water Resources Control Board
Attn: NPDES Wastewater Unit
1001 I Street, 15th Floor
Sacramento, CA 95814
Contact: Gurgan Chand
(916) 341-5780

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 gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the 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."

Signed and Agreed:

Tony Williams
General Manager
Professional Engineer (Civil) # 62627
North Marin Water District

Stephen Burkholder
Senior Biologist
Pest Control Adviser # 153644
Blankinship & Associates, Inc.

Michael S. Blankinship
Professional Engineer (Civil) # 64112
Pest Control Adviser # 75890
Blankinship & Associates, Inc.

Limitations

The services used to prepare this document were performed consistent with the agreement with North Marin Water District and were rendered in a manner consistent with generally accepted professional consulting principles and practices using the level of care and skill ordinarily exercised by other professional consultants under similar circumstances at the same time the services were performed. No warranty, express or implied, is included. This document is solely for the use of our client. **Any use or reliance on this document by a third party is not authorized and is at such party's sole risk.**

North Marin Water District
Aquatic Pesticide Application Plan

Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications
Water Quality Order No. 2013-0002-DWQ
General Permit # CAG990005
WDID # 2 215031001

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List of Abbreviations

AHAL	Aquatic Herbicide Application Log
APAP	Aquatic Pesticide Application Plan
BG	Background
BMPs	Best Management Practices
°C	Degrees Celsius
COC	Chain of Custody
CTR	California Toxics Rule
District	North Marin Water District
DO	Dissolved Oxygen
DPR	California Department of Pesticide Regulation
Event	Event Monitoring
FB	Field Blank
FD	Field Duplicate
ft/sec	Feet per second
HPLC	High-performance liquid chromatography
IPM	Integrated Pest Management
MB	Method Blank
MIB	2-methylisoborneol
MRP	Monitoring and Reporting Program
MS	Matrix Spike
MSD	Matrix Spike Duplicates
NPDES	National Pollutant Discharge Elimination System
NOI	Notice of Intent
OSHA	California Occupational Safety and Health Administration
PCA	Pest Control Adviser
Permit	The Statewide General NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications
Policy	State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
Post	Post-event monitoring
PPE	Personal Protective Equipment
QAC	Qualified Applicator Certificate
QAL	Qualified Applicator License
QA/QC	Quality Assurance and Quality Control
%R	Percent Recovery
RPD	Relative Percent Difference
RWL	Receiving Water Limitation
RWMT	Receiving Water Monitoring Trigger
RWQCB	Regional Water Quality Control Board
SIP	State Implementation Policy
SWRCB	State Water Resources Control Board
USEPA	United Stated Environmental Protection Agency
WDID	Waste Discharge Identification

Aquatic Pesticide Application Plan

The State Water Resources Control Board (SWRCB) Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (herein referred to as the "Permit") was adopted on March 5, 2013 and became active on December 1, 2013 (SWRCB 2013). The Permit, Water Quality Order No. 2013-0002-DWQ, expired November 30, 2018, and has been administratively continued until a new permit is adopted. As such, the Permit is still active and enforceable. The Permit requires compliance with the following:

- The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California, also known as the State Implementation Plan, or SIP (SWRCB 2005)
- The California Toxics Rule (CTR) (CTR 2000)
- San Francisco Bay Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (RWQCB 2019)
- Permit-defined Receiving Water Limitations (RWLs) and Receiving Water Monitoring Triggers (RWMTs)

Coverage under the Permit is available to single dischargers and potentially to regional dischargers for releases of potential and/or actual pollutants to Waters of the United States. Dischargers eligible for coverage under the Permit include public entities that conduct resource or pest management control measures. Examples of eligible dischargers include local, state, and federal agencies responsible for control of algae, aquatic weeds, and other organisms that adversely impact the operation and use of drinking water reservoirs, water conveyance facilities, irrigation canals, flood control channels, detention basins and/or natural water bodies.

The Permit does not cover indirect or non-point source discharges, whether from agricultural or other applications of pesticides to land, that may be conveyed in storm water or irrigation runoff. The Permit allows enrollees to discharge residual algaecide and aquatic herbicide active ingredients, subject to discharge limitations and Basin Plan objectives. The Permit covers discharges of residues of algaecides and aquatic herbicides that are applied according to label directions and that are registered for use on aquatic sites by the California Department of Pesticide Regulation (DPR).

North Marin Water District's (herein referred to as the "District") primary objective is to provide municipal water to Novato and areas in West Marin County (Point Reyes Station, Olema, Bear Valley, Inverness Park, and Paradise Ranch Estates). It serves a suburban population of approximately 64,000 people situated in and about the City of Novato which is located in an inland coastal valley of Marin County, California. The District also serves several small improvement districts in the West Marin area near the coast.

Stafford Lake was created with the construction of Stafford Dam on Novato Creek in 1951. It was created to provide a municipal water source for the growing Novato community. The District owns and operates the Stafford Dam and Stafford Lake. Stafford Lake is located on Novato Creek, four miles west of downtown Novato, adjacent to Novato Boulevard (old Hicks Valley Road). Additionally, the District owns over 800 acres of Stafford Lake's shoreline and watershed area, primarily to the south and west of the lake. Refer to **Figure 1** and **Figure 2.**

The District operates the Stafford Lake Water Treatment Plant during spring and summer months to supplement surface water supplies from the Russian River or groundwater delivered to its customers. Up

to about 20% of the District's demand is met with water from Stafford Lake, varying with the water year and storage level from winter runoff. Stafford Lake experiences algae blooms of blue-green algae, also known as cyanobacteria, throughout the year. Blooms during the late spring and summer months when the drinking water treatment plant is in use create operational challenges and could result in the District not meeting customer demand. Prior to the 2006 renovation and upgrades to the treatment plant, algae blooms also resulted in customer complaints of adverse taste and odor of the water caused by genera of cyanobacteria that produce 2-methylisoborneol (MIB) and geosmin. The current treatment process of oxidation with chlorine dioxide, coagulation and activated carbon filtration is generally able to remove taste and odor compounds and, if present, algal toxins.

Toxins produced by some cyanobacteria can be harmful to humans, fish, and other animals. Observation of toxin production has increased globally and in California. Some species identified in Stafford Lake are known to produce toxins under some environmental conditions or in response to stressors. The factors that may influence toxin production in some cyanobacteria include algal density, temperature stress, nutrient availability, light availability or competition, and predation. The toxin microsystin-LR was detected in 2021, likely due to a microcystis bloom.

The District is committed to the protection of the source water quality of Novato's local municipal water supply. A Watershed Management Plan has been developed to identify future activities. Some protection activities include cooperative erosion control with surrounding landowners on the watershed, Best Management Practices for cattle grazing and horse stables, development of a manure management plan, control over the use and type of fertilizers used by the golf course and nearby county park, installation of runoff sedimentation basins, development of the Stafford Lake County Park's master plan, involvement with Students and Teachers Restoring A Watershed (STRAW), and riparian fencing.

District staff conducts routine sampling in the lake to assess algae populations, nutrient availability and general water quality parameters. Species present at the surface and various water intake depths are generally identified and counted, and samples may be analyzed for chlorophyll-*a*. When populations of known nuisance genera (i.e., *Dolichospermum*, *Woronichinia, Lyngbya*, *Oscillatoria*, *Microcystis*, *Aphanizomenon*, etc.) are observed to be increasing, monitoring frequency is increased. If algae counts and staff observation shows exponential growth, indicating that a bloom is imminent or occurring, treatment plant operations are modified to accommodate treatment of algae-containing water. This results in increased treatment chemical usage, longer treatment times and reduced drinking water production capacity. To minimize operational impacts due to an algae bloom, the District may consider application of an algaecide.

The District has previously applied algaecides and aquatic herbicides using the SWRCB's 2004 Permit and obtained a SIP Exception, allowing short-term or seasonal exceedance of the dissolved copper RWL. Due to ongoing concerns about water supply reliability and the increasing occurrence of blooms, the District may need to apply aquatic herbicides or algaecides again in the future. As part of an Integrated Pest Management (IPM) approach, the District intends to apply algaecides and aquatic herbicides identified in the Notice of Intent to Comply (NOI) submitted to the SWRCB. For the purposes of applying to, and complying with, the Permit, the District has created this Aquatic Pesticide Application Plan (APAP).

This APAP is a comprehensive plan developed by the District that describes the project, the need for the project, what may be done to reduce water quality impacts, and how those impacts will be monitored. Specifically, this APAP contains the following eleven (11) elements.

1. Description of the water system to which algaecides and aquatic herbicides are being applied;

2. Description of the treatment area in the water system;

3. Description of types of weed(s) and algae that are being controlled and why;

4. Algaecide and aquatic herbicide products or types of algaecides and aquatic herbicides expected to be used and if known their degradation byproducts, the method in which they are applied, and if applicable, the adjuvants and surfactants used;

5. Discussion of the factors influencing the decision to select algaecide and aquatic herbicide applications for algae and weed control;

6. If applicable, list the gates or control structures to be used to control the extent of receiving waters potentially affected by algaecide and aquatic herbicide application and provide an inspection schedule of those gates or control structures to ensure they are not leaking;

7. If the Discharger has been granted a short-term or seasonal exception under State Water Board Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Policy) section 5.3 from meeting acrolein and copper receiving water limitations, provide the beginning and ending dates of the exception period, and justification for the needed time for the exception. If algaecide and aquatic herbicide applications occur outside of the exception period, describe plans to ensure that receiving water criteria are not exceeded because the Dischargers must comply with the acrolein and copper receiving water limitations for all applications that occur outside of the exception period;

8. Description of monitoring program;

9. Description of procedures used to prevent sample contamination from persons, equipment, and vehicles associated with algaecide and aquatic herbicide application;

10. Description of the Best Management Practices (BMPs) to be implemented. The BMPs shall include, at the minimum:

    10.1. Measures to prevent algaecide and aquatic herbicide spill and for spill containment during the event of a spill;

    10.2. Measures to ensure that only an appropriate rate of application consistent with product label requirements is applied for the targeted weeds or algae;

    10.3. The Discharger's plan in educating its staff and algaecide and aquatic herbicide applicators on how to avoid any potential adverse effects from the algaecide and aquatic herbicide applications;

    10.4. Discussion on planning and coordination with nearby farmers and agencies with water rights diversion so that beneficial uses of the water (irrigation, drinking water supply, domestic stock water, etc.) are not impacted during the treatment period; and

    10.5. A description of measures that will be used for preventing fish kill when algaecides and aquatic herbicides will be used for algae and aquatic weed controls.

11. Examination of Possible Alternatives. Dischargers should examine the alternatives to algaecide and aquatic herbicide use to reduce the need for applying algaecides and herbicides. Such methods include:

    11.1. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms including plants, algaecide and aquatic herbicide resistance, feasibility, and cost effectiveness should be considered:

        11.1.1. No action;

        11.1.2. Prevention;

        11.1.3. Mechanical or physical methods;

        11.1.4. Cultural methods;

        11.1.5. Biological control agents; and

        11.1.6. Algaecides and aquatic herbicides;

        If there are no alternatives to algaecides and aquatic herbicides, Dischargers shall use the minimum amount of algaecides and aquatic herbicides that is necessary to have an effective control program and is consistent with the algaecide and aquatic herbicide product label requirements.

    11.2. Using the least intrusive method of algaecide and aquatic herbicide application; and

    11.3. Applying a decision matrix concept to the choice of the most appropriate formulation.

This APAP is organized to address the aforementioned 1 through 11 elements.

	DATE	DESCRIPTION	INIT.

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(530) 757 -0941

PROJECT: North Marin Water District 2022 APAP

FIGURE: 1

DESCRIPTION: Project Location Map

DATE

	DATE	DESCRIPTION	INIT.

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PROJECT: North Marin Water District
2022 APAP

FIGURE: 2

DESCRIPTION: Stafford Lake Map

DATE

Element 1: Description of the Water System

The District owns and operates Stafford Dam and Stafford Lake. Stafford Lake is located on Novato Creek, four miles west of downtown Novato adjacent to Novato Boulevard (old Hicks Valley Road), and was created with the construction of Stafford Dam in 1951 to provide a municipal water source for the growing Novato community. It provides approximately 20% of Novato's water supply, collecting runoff from 8.3 square miles of watershed property located upstream at the upper tributary reaches to Novato Creek. Sixteen percent of the Stafford Lake watershed is owned by the District. Eighty percent is privately owned and used for primarily agriculture (beef cattle and stables). Marin County Parks and Open Space own the remaining acres.

Stafford Lake is approximately 231 surface acres, with capacity to store 4,287 acre-feet of water when the water surface elevation is at 196.0 feet, the height of the dam's spillway. Water the lake is drawn into the outlet tower and fed by gravity or by pumping (depending on the lake level) into the treatment plant located just below the dam.

Refer to **Figure 1** and **Figure 2**.

Element 2: Description of the Treatment Area

The District may apply algaecides or aquatic herbicides to Stafford Lake, described in **Element 1**, if aquatic weeds or algae treatment thresholds are met.

Element 3: Description of Weeds and Algae

Drinking water quality and taste, as well as the ability to deliver the capacity of water needed to meet customer demand is critical to the District. The presence of algae and floating or submerged weeds in Stafford Lake can create nuisance tastes and odors to the drinking water as well as slow or stop the flow of water in pipes, clog pumps, and block screens, thus preventing treatment, and therefore delivery of municipal water.

Additionally, certain genus and species of algae and cyanobacteria identified in Stafford Lake have been known to produce toxins under some environmental conditions or in response to stressors. The District routinely monitors for the types of algae and cyanobacteria present in the lake which include, but are not limited to: *Dolichospermum* (formerly *Anabaena*)*, Aphanizomenon, Gloeotrichia, Lyngbya, Myicrocystis, Oscilatoria, Schroderia, Stephanodiscus, and Tribonema*.

Element 4: Algaecides and Aquatic Herbicides Used, Known Degradation Byproducts, Application Methods and Adjuvants

Table 1 summarizes the algaecides and/or aquatic herbicides that may be used by the District.

Table 1: Algaecides and/or Aquatic Herbicides That May be Used

Herbicide	Application Method(s)	Adjuvant	Degradation Byproducts
Copper – Chelated	Handgun, boom sprayer, subsurface injection	As Needed	None, persists as various speciations of copper[1]
Copper Sulfate	Slug application, spreader, submersed burlap sack, submersed mesh basket	Not Applicable	None, persists as various speciations of copper[1]
Fluridone	Handgun, boom sprayer, spreader (granules), subsurface injection	Not Applicable	N-methyl Formamide[2]
Hydrogen Peroxide[3]	Handgun, boom sprayer, subsurface injection	As Needed	Water and oxygen
Peroxyacetic Acid	Handgun, boom sprayer, subsurface injection	As Needed	Oxygen, carbon dioxide, water, and acetic acid[4]
Sodium Carbonate Peroxyhydrate	Handgun (slurry), subsurface injection (slurry), spreader (granules), slug application	Not Applicable	Sodium carbonate, water, and oxygen[5]
Triclopyr	Handgun, boom sprayer, subsurface injection, spreader (granules)	As Needed	3,5,6-trichloro-2-pyridinol (TCP)[6] and 3,5,6-trichloro-2-methoxypyridine (TMP)[7]

[1] USEPA 2009

[2] NMF was identified as the major degradant of fluridone when applied to water bodies (USEPA 2004). Minor degradants may include: 1-methyl-3-(4-hydroxyphenol)-5-[3-trifluoromethyl)phenyl]- 4[1H]-pyridone and 1,4-dihydro-1-methyl-4-oxo-5-[3-(trifluoromethyl)phenyl]-3-pyridine (West *et al. 1983* as cited in McLaren/Hart, 1995), and benzaldehyde, 3-(trifluoromethyl)-benzaldehyde, benzoic acid and 3-(trifluoromethyl)- benzoic acid (Saunders and Mosier, 1983 as cited in McLaren/Hart, 1995).

[3] Hydrogen Dioxide is a synonym for Hydrogen Peroxide and shares the same CAS number (CAS No. 772-84-1).

[4] USEPA 1993

[5] USEPA 2002

[6] USEPA 1998

[7] Petty 2003

As needed or recommended, DPR-approved adjuvants labeled for Aquatic applications may be used to enhance the efficacy of a selected product. The District intends to only use adjuvants that do not contain nonylphenol.

All algaecide and aquatic herbicide applications are made in accordance with the product label. For example, an application of liquid copper to Stafford Lake may be made by lowering weighted drop hoses into the water column and delivering a known amount of product to the application area to achieve the target concentration.

Element 5: Discussion of Factors Influencing Herbicide Use

Management of algae and aquatic vegetation in Stafford Lake by the District is guided by the application of IPM. One of the primary operational goals of the IPM program is to establish a general and reasonable set of control measures that not only aid in managing algae or aquatic vegetation populations, but also address public health & safety, economic, legal, regulatory, and aesthetic concerns or requirements. An action threshold level is the point at which action should be taken to control algae and aquatic vegetation before the water treatment plant's ability to meet production capacity needs, minimize drinking water treatment chemical demand, and/or produce high quality drinking water is impacted. Moreover, established action threshold levels may change based on time of year, customer water demand from the reservoir/plant, or water customer expectations.

A central feature of IPM is to determine when control action is necessary and when it is not. Site scouting and regular reconnaissance of the lake, algae and water quality conditions are ways the District gathers, records and retains information to inform operational actions and the potential need for implementing a control action like applying algaecide. District staff conducts water quality monitoring and evaluation of algae populations throughout the year when the treatment plant is in operation. Analytes and trends monitored related to algae treatment thresholds include temperature and dissolved oxygen (DO) profiling, pH, turbidity, algae quantification and identification, chlorophyll-*a* and secchi depth. The presence of some algae and aquatic vegetation in the lake may be a sign of a well-balanced, flourishing ecosystem. However, during algae blooms the balance of green algae, diatoms and/or cyanobacteria shifts due to biotic or abiotic factors, and one to a few species account for most of the algal biomass present in the lake. When an active bloom is detected by the District, the dominate specie(s) is/are evaluated to determine if they are potentially toxigenic (PTOX) (Chapman 2019).

Examples of when or how thresholds are met are when algae causes complaints of taste and odor issues in drinking water, toxin-producing species are present at high density, or the District is unable to treat enough water volume to meet user demand. Adverse impacts to aesthetics of Stafford Lake do not trigger threshold exceedance. Common challenges associated with algae blooms are adverse impacts to water quality and nuisance tastes and odors.

If the algae or aquatic vegetation in Stafford Lake equals or exceeds a threshold, a control method is implemented. Control methods considered include mechanical, cultural controls, biological, and/or chemical controls, consistent with the District's IPM techniques. Algaecide and/or aquatic herbicide use may or may not be employed as a control measure and is considered a critical part of the IPM program. For algal blooms that are in progress and have exceeded a threshold, algaecides offer the most effective control strategy.

Alternatively, the District's monitoring may indicate that algae and/or aquatic vegetation populations are stable or naturally declining. In this case, no action would be taken. The District does not intend to stop all algal and aquatic vegetation growth or blooms. Instead, the focus is on preventing the challenges algae or aquatic vegetation create relative to drinking water treatment and production capacity. The presence of non-problematic algae and aquatic vegetation may be beneficial as they are likely occupying an overlapping niches and directly competing with the problem algae species.

Algaecide application and/or aquatic herbicide applications may also be made prior to threshold exceedance as part of an early detection rapid response approach. For example, treatments may be planned based on District's staff knowledge and observation of ambient quality conditions (e.g., nutrients,

warming epilimnion, etc.) or algal density and predicted growth rate. The identification of some species of algae may also reasonably be used to predict future problems based on historical species composition trends. Accordingly, algae may be treated soon after detection and observation of significant increase in population numbers. Though algae may not be an immediate problem at this phase, treating them before the bloom enters an exponential growth phase is intended to prevent the population from reaching densities where adverse impacts like reduced plant treatment capacity or the production of toxins would occur.

An additional benefit from the application of IPM is that the total amount of algaecide and/or aquatic herbicide applied is reduced. For example, treating algae and aquatic vegetation earlier in the growth cycle generally results in fewer controls needed and less total algaecide or herbicide used. Selection of appropriate algaecide and aquatic herbicide(s) and application rate(s) is done based on the identification of the algae and aquatic weed, its growth stage, density, and label language indicating that the product is registered for use in the site and on the species of interest.

The selection of and decision to use an algaecide is based on the recommendation of a DPR-licensed Pest Control Adviser (PCA). The PCA considers a variety of control options that may include mechanical and/or cultural techniques that alone or in combination with algaecide use are the most efficacious and protective of the environment.

Evaluating alternative control techniques is part of the District's IPM approach; therefore, an alternative treatment may be implemented. If appropriate, the District may elect to test new approaches as part of a test or pilot program. Examples of alternative control techniques include mechanical removal and prevention of nutrient loading. A more detailed description of each of these is presented in **Element 11** of this document. In general, alternative control techniques are more expensive, labor intensive, and less effective; however, they may be implemented as feasible.

Element 6: Gates and Control Structures

The District owns and operates the Stafford Dam and Stafford Lake. Water from Stafford Lake is drawn by the outlet tower and fed by gravity or by pumping (depending on the lake level) into the treatment plant located just below the dam. As applicable or necessary, District staff will close gates, valves or other structures during an algaecide or aquatic herbicide application to control the extent, if any, that receiving waters will be affected by residual algaecides or aquatic herbicides.

To evaluate the presence of leaks, control structures within the treatment area will be inspected prior to and during the application. **Figure 3,** Aquatic Herbicide Application Log (AHAL), is the form used to document this inspection. If leaks develop on closed valves or gates, they will be stopped as soon as practicable.

Element 7: State Implementation Policy (SIP) Section 5.3 Exception

The District has applied for and been granted a SIP Section 5.3 Exception for the use of copper by the SWRCB. The District's exception period for applications of copper-containing algaecides or aquatic herbicides is from April through October on an as-needed basis to control algae or aquatic vegetation in Lake Stafford.

The District does not anticipate using copper-containing products outside of the exception period.

Consistent with SIP exception requirements, after completion of copper applications for the year, a qualified biologist certifies that beneficial uses of receiving waters have been restored.

Element 8: Description of Monitoring Program

Attachment C of the Permit presents the Monitoring and Reporting Program (MRP). The MRP addresses two key questions:

> Question No. 1: Does the discharge of residual algaecides and aquatic herbicides cause an exceedance of the receiving water limitations?
>
> Question No. 2: Does the discharge of residual algaecides and aquatic herbicides, including active ingredients, inert ingredients, and degradation byproducts, in any combination cause or contribute to an exceedance of the "no toxics in toxic amount" narrative toxicity objective?

Attachment C of the Permit provides MRP guidelines that the District will use to meet the aforementioned goals.

8.1 Data Collection

Visual monitoring will be performed for all algaecide and aquatic herbicide applications and be recorded by qualified personnel.

Figure 3 (AHAL) or its equivalent and **Figure 4** (Aquatic Herbicide Field Monitoring & Sampling Form) or its equivalent will be used.

Fig. 3 Aquatic Herbicide Application Log

For Client Use Only

****IMPORTANT** To Be Completed EVERY TIME an Aquatic Herbicide Application is Made**

App. Start: Time _____ Date _____

App. End: Time _____ Date _____

Application Location _____

Agency _____ Personnel _____

Air Temperature (Fº) _____ Wind Speed (mph) _____ Target Weeds _____

Treatment Area Size (choose one):

☐ Acres _____ ☐ Linear Feet _____

Herbicide #1 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Herbicide #2 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Adjuvant #1 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Adjuvant #2 Used _____ Rate/Target Conc. _____ Units _____ Total Amt. Applied _____ Units _____

Method of Application _____ Application Made (Circle One) **With** water flow / **Against** water flow / **Not Applicable**

Waterbody Type (Circle One) lined canal / unlined canal / creek / drain / ditch / basin / reservoir / lake / pond or list Other: _____

Water Flow (ft/sec, cfs) _____ Water Depth (ft) _____ Water Temperature (Fº) _____

Percent Weed Cover _____ Water Sheen (Circle One) yes / no

Water Color (Circle One) none / blue / green / brown Water Clarity (Circle One) poor / fair / good

Please enter any other information regarding the application in the space provided below:

I (sign name) _____ certify that the APAP has been followed.

Figure 4: Aquatic Herbicide Field Monitoring & Sampling Form

****IMPORTANT** Attach Relevant Aquatic Herbicide Application Log (AHAL) Form**

SAMPLE #1: Background Monitoring (Background)

Collect upstream of or just outside of treatment area at time of treatment, or within in treatment area within 24 hours of the treatment starting.

Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

Section 4: Site Observations *(Refer to Definitions Sheet and mark a response for each field)*

DO YOU NOTICE	N/A	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident				
Floating Material				
Settleable Substances				
Suspended Material				
Bottom Deposits				
Tastes and Odors				
Water Coloration				
Visible Films, Sheens, or Coatings				
Fungi, Slimes, or Objectionable Growths				
Aquatic Community Degradation				

Figure 4: Aquatic Herbicide Field Monitoring & Sampling Form

SAMPLE #2: Event Monitoring (Event)

Collect just outside of the treatment area immediately after the application of herbicide(s), but after sufficient time has elapsed such that treated water would have exited the treatment area. The timing for the collection of this sample will be a site-specific estimation.

Is water leaving the treatment area? ☐ **Yes** ☐ **No**

If no water is leaving the treatment area, complete sections 1, 2, and 4, skip section 3, and do not collect a sample.

Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

DO YOU NOTICE	N/A	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident				
Floating Material				
Settleable Substances				
Suspended Material				
Bottom Deposits				
Tastes and Odors				
Water Coloration				
Visible Films, Sheens, or Coatings				
Fungi, Slimes, or Objectionable Growths				
Aquatic Community Degradation				

Figure 4: Aquatic Herbicide Field Monitoring & Sampling Form

****For each active ingredient, one Field Duplicate and one Field Blank must be collected per environmental setting (moving water vs static water) per year****

SAMPLE #3: Post-Event Monitoring (Post)

Collect from inside treatment area within 7 days of application, or when treatment is deemed complete.

Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Environmental Setting (circle one): Flowing | Static

Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _____

GPS Coordinates: _____

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

Section 3: Water Quality Characteristics

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

DO YOU NOTICE	N/A	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident				
Floating Material				
Settleable Substances				
Suspended Material				
Bottom Deposits				
Tastes and Odors				
Water Coloration				
Visible Films, Sheens, or Coatings				
Fungi, Slimes, or Objectionable Growths				
Aquatic Community Degradation				

Figure 4: Aquatic Herbicide Field Monitoring & Sampling Form

**** For each active ingredient, one Field Duplicate (FD) and one Field Blank (FB) must be collected per environmental setting (moving water vs static water) per year****

Field Duplicate (FD) Sample:

Collect at same location and time as the monitoring sample (if possible collect with event or post-event sample) and using the same sampling technique.

Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Monitoring Location: _*See (circle one): BG / Event / Post*_

GPS Coordinates: _*See (circle one): BG / Event / Post*_

Sketch monitoring location or describe location with identifiable points of reference (required if GPS coordinates not provided).

Section 3: Water Quality Measurements

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec)*: _____

** Water speed only required for flowing water*

Section 4: Site Observations (*Refer to Definitions Sheet and mark a response for each field)*

See (circle one): BG / Event / Post

DO YOU NOTICE	N/A	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident				
Floating Material				
Settleable Substances				
Suspended Material				
Bottom Deposits				
Tastes and Odors				
Water Coloration				
Visible Films, Sheens, or Coatings				
Fungi, Slimes, or Objectionable Growths				
Aquatic Community Degradation				

Figure 4: Aquatic Herbicide Field Monitoring & Sampling Form

**** For each active ingredient, one Field Duplicate (FD) and one Field Blank (FB) must be collected per environmental setting (moving water vs static water) per year****

Field Blank (FB) Sample:

Prepare using distilled water at the monitoring site immediately prior to or immediately after the collection of the monitoring sample.

Section 1: Herbicide Application Information

Agency: _____

System Treated: _____

Application Start Date: _____

Herbicides Applied: _____

Surfactants Used: _____

Target Vegetation: _____

Section 2: Monitoring Information

Monitoring Date: _____ Time: _____

Sampler Name: _____

Section 3: Water Quality Measurements

DO (mg/L): _____ EC (µS/cm): _____ pH: _____

Temperature (°C): _____ Turbidity (NTU): _____ Water speed (ft/sec): ____N/A____

Section 4: Site Observations *(Refer to Definitions Sheet and mark a response for each field)*

DO YOU NOTICE	N/A	NO	UNKNOWN	YES, THE BENEFICIAL USE IS ADVERSELY AFFECTED. DESCRIBE.
Adverse Incident	X			
Floating Material	X			
Settleable Substances	X			
Suspended Material	X			
Bottom Deposits	X			
Tastes and Odors	X			
Water Coloration	X			
Visible Films, Sheens, or Coatings	X			
Fungi, Slimes, or Objectionable Growths	X			
Aquatic Community Degradation	X			

8.2 Monitoring Locations and Frequency

Water quality sampling is required for applications of products that contain sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide, however, no chemical analysis for the hydrogen peroxide class of active ingredients is needed. If applications of sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide are made, the District will collect samples and complete sampling forms consistent with Permit requirements. Samples will be analyzed for field parameters including pH, DO, temperature, turbidity and electrical conductivity.

For application of other active ingredients, the District will collect samples from a minimum of six application events for each active ingredient in each environmental setting per year. If there are less than six application events in a year for an active ingredient, the District will collect samples for each application event in each environmental setting (e.g., flowing water and non-flowing water). Currently, the only applicable environmental setting applicable to the District's Permit-related activities in Lake Stafford is non-flowing water. Samples will be analyzed for active ingredient residues and field parameters including pH, DO, temperature, turbidity and electrical conductivity.

If the results from six consecutive sampling events show concentrations that are less than the applicable receiving water limitation/trigger in an environmental setting, the District will reduce the sampling frequency for that active ingredient to one per year in that environmental setting (e.g., in the non-flowing water setting of Lake Stafford). If the annual sampling shows exceedances of the applicable receiving water limitation/trigger, the District will be required to return to sampling six applications the next year, and until sampling may be reduced again.

If a partial lake application is made, sites will be chosen to represent the variations in treatment that occur, including algaecide or aquatic herbicide use, hydrology, and environmental setting, location of application, wind influence, water movement within the lake, and seasonal variations. The exact location(s) of sample site(s) will be determined after site scouting and a decision to make an aquatic herbicide application are made. **Figure 4** is the form used to document sampling.

8.2.1 Sample Locations

Sampling will include Background, Event, and Post-event monitoring as follows:

Background Monitoring: In static water, the background (BG) sample is collected in the treatment area, within 24 hours prior to the start of the application.

Event Monitoring: The Event sample for **non-flowing (static)** water is collected immediately outside the treatment area immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.

The location and timing for the collection of the Event sample may be based on a number of factors including, but not limited to algae and aquatic weed density and type, flow rates, size of the treatment area and duration of treatment.

Post-event Monitoring: The post-event monitoring (Post) sample is collected within the treatment area within one week after the application, or when the treatment is deemed complete.

One full set of three samples (e.g., BG, Event and Post) will be collected during each treatment from the representative site(s) treated within the District according to the monitoring frequency and locations described earlier. Additionally, one Field Duplicate (FD) and one Field Blank (FB) sample will be collected and submitted for analysis for each analyte, once per year. The FD and FB samples should be collected during Event Monitoring, if applicable.

See **Figure 4** for the field sampling form used.

8.3 Sample Collection

If the water depth is 6 feet or greater, the sample will be collected at a depth of 3 feet. If the water depth is less than 6 feet, the sample will be collected at the approximate mid-depth. As necessary, an intermediary sampling device (e.g., Van Dorn-style sampler or long-handled sampling pole) will be used. Sample scoopers are used to collect samples at the approximate desired sampling depth and used to fill clean sample bottles. Appropriate cleaning technique is discussed in **Element 8.8.4**.

8.4 Field Measurements

In conjunction with sample collection, temperature and dissolved oxygen will be measured in the field. Turbidity, electrical conductivity, and pH may be measured in the field using field meters as available, or analyzed in the laboratory. Turbidity, pH, and DO meters are calibrated according to manufacturer's specifications at the recommended frequency, and checked with a standard prior to each use. Conductivity meters are generally calibrated by the manufacturer and will be checked according to manufacturer's specifications with standards throughout the year (typically once per month) to evaluate instrument performance. If the calibration is outside the manufacturer's specifications, the conductivity probe will be recalibrated. Calibration logs are maintained for all instruments to document calibration, upkeep and performance.

8.5 Sample Preservation and Transportation

Samples may be collected directly into unpreserved containers. If the analytical method requires use of a preserved container, an intermediary sampling container or device such as a Van Dorn or unpreserved container will be used to collect the sample, and either poured into a preserved container or preserved at the laboratory upon receipt. Once a sample is collected and labeled it will immediately be placed in a dark, cold (~4° C) environment, typically a cooler with ice. Samples will be delivered to the laboratory as soon as practicable after sample collection.

8.6 Sample Analysis

Table 2 shows the constituents that each sample must be analyzed for. Note that the analytical methods listed are those commonly used for sample analysis. Method details obtained from NEMI (2021). Analytes may be analyzed using analytical methods described in 40 CFR Part 136 or equivalent methods that are commercially and reasonably available and that provide quantification of sampling parameters and constituents sufficient to evaluate compliance with applicable effluent limits and to perform reasonable potential analysis. Equivalent methods must be more sensitive than those specified in 40 CFR Part 136 if the method is available in 40 CFR Part 136, and must be approved for use by the Regional Water Board Executive Officer. Methods not specified in 40 CFR Part 136 may include modifications to methods specified in 40 CFR Part 136 or other methods as deemed appropriate by the analytical laboratory.

Table 2: Required Sample Analysis

Analyte	Analytical Method	Reporting Limit	Hold Time (Days)	Container	Preservative
Temperature[1]	N/A	N/A	Immediately	N/A	N/A
Dissolved Oxygen[1]	360.1 or 360.2	0.0 mg/L	Immediately	N/A	None
Turbidity[2]	EPA 180.1, SM 2130B	0.00 NTU	2	100 mL HDPE	None
Electrical Conductivity[2]	EPA 120.1, SM2510B	0.0 µS/cm	28	100 mL HDPE	None
pH[2]	EPA 150.2, SM4500 H+	1-14	Immediately	100 mL HDPE	None
Hardness[3]	SM2340C	0.332 mg $CaCO_3$/L	1 Day if unpreserved; 180 Days if preserved	250 mL HDPE	HNO_3
*Copper (dissolved)[4]	200.8	0.5 µg/L	1 Day if unpreserved; 180 Days if preserved	250 mL HDPE	HNO_3
*Fluridone	SePRO FasTest, HPLC	1.0 ug/L	7	30 ml Brown HDPE or 2 x 40 mL VOA	None
Nonylphenol[5]	EPA 550.1m, GC/MS	0.5 µg/L	7	2 x 40 mL VOA	None
*Triclopyr	8151, 8150A, 615	1.0 µg/L	7	2 x 40 mL VOA	None

Notes:
Active ingredient analysis not required for algaecides and aquatic herbicides containing sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide; field parameters must be measured and reported.
* Signifies algaecide or aquatic herbicide active ingredient. Chemical analysis is only required for the active ingredient(s) used in treatment.
[1] Field measured.
[2] May be field or laboratory measured.
[3] Required for copper applications only.
[4] Per EPA 200.8, samples for dissolved copper should be filtered with a 0.45µm filter at the time of collection or as soon thereafter as practically possible.
[5] Required only when adjuvant ingredients are represented by the surrogate nonylphenol.

8.7 Reporting Procedures

An annual report for each reporting period, from January 1 to December 31 will be prepared by March 1 of the following year and will be submitted to the San Francisco Bay RWQCB and SWRCB. In years when no algaecides or aquatic herbicides are used, a letter stating no applications were made will be sent to the Central Coast RWQCB and SWRCB in lieu of an annual report.

The annual report will contain the following information as described in Attachment C of the Permit:

1. An Executive Summary discussing compliance or violation of the Permit and the effectiveness of the APAP; and
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of algaecide or aquatic herbicide application.

The District will collect and retain all information on the previous reporting year. When requested by the Deputy Director or Executive Officer of the Central Coast RWQCB, the District will submit the annual information collected, including:

1. An Executive Summary discussing compliance or violation of the Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with herbicide applications;
2. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of algaecide or aquatic herbicide application, if appropriate, and recommendations for improvement to the APAP (including proposed BMPs) and monitoring program based on the monitoring results. All receiving water monitoring data shall be compared to applicable receiving water limitations and receiving water monitoring triggers;
3. Identification of BMPs and a discussion of their effectiveness in meeting the Permit requirements;
4. A discussion of BMP modifications addressing violations of the Permit;
5. A map showing the location of each treatment area;
6. Types and amounts of aquatic herbicides used at each application event during each application
7. Information on surface area and/or volume of treatment area and any other information used to calculate dosage, concentration, and quantity of each aquatic herbicide used;
8. Sampling results shall indicate the name of the sampling agency or organization, detailed sampling location information (including latitude and longitude or township/range/section if available), detailed map or description of each sampling area (address, cross roads, etc.), collection date, name of constituent/parameter and its concentration detected, minimum levels, method detection limits for each constituent analysis, name or description of water body sampled, and a comparison with applicable water quality standards, description of analytical QA/QC plan. Sampling results shall be tabulated so that they are readily discernible; and
9. Summary of AHALs (**Figure 3**).

The District will report to the Central Coast RWQCB and SWRCB any noncompliance, including any unexpected or unintended effect of an algaecide or aquatic herbicide that may endanger health or the environment. The Twenty-Four Hour Report will be provided orally, by way of a phone call, to the SWRCB and Central Coast RWQCB within 24 hours from the time the District becomes aware of any noncompliance. The Twenty-Four Hour Report will include the following information:

1. The caller's name and telephone number;
2. Applicator name and mailing address;
3. Waste Discharge Identification (WDID) number;
4. How and when the District became aware of the noncompliance;
5. Description of the location of the noncompliance;
6. Description of the noncompliance identified and the USEPA pesticide registration number for each product the District or its contractor applied in the area of the noncompliance; and
7. Description of the steps that the District has taken or will take to correct, repair, remedy, cleanup, or otherwise address any adverse effects.

If the District is unable to notify the RWQCB and SWRCB within 24 hours, the District will do so as soon as possible and provide a rationale for why the District was unable to provide notification of noncompliance within 24 hours.

In addition to the Twenty-Four Hour Report, the District will provide a written submission within five (5) days of the time the District becomes aware of the noncompliance if not waived by the RWRCB or SWRCB. The Five-Day Written Report will contain the following information:

1. Date and time the District contacted the State Water Board and the appropriate Regional Water Board notifying of the noncompliance and any instructions received from the State and/or Regional Water Board; information required to be provided in Section D.1 (24-Hour Reporting);
2. A description of the noncompliance and its cause, including exact date and time and species affected, estimated number of individual and approximate size of dead or distressed organisms (other than the pests to be eliminated);
3. Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc.);
4. Magnitude and scope of the affected area (e.g. aquatic square area or total stream distance affected);
5. Algaecide and aquatic herbicide application rate, intended use site (e.g., banks, above, or direct to water), method of application, and name of algaecide and herbicide product, description of algaecide and herbicide ingredients, and USEPA registration number;
6. Description of the habitat and the circumstances under which the noncompliance activity occurred (including any available ambient water data for aquatic algaecides and aquatic herbicides applied);
7. Laboratory tests performed, if any, and timing of tests. Provide a summary of the test results within five days after they become available;
8. If applicable, explain why the District believes the noncompliance could not have been caused by exposure to the algaecides or aquatic herbicides from the application; and
9. Actions to be taken to prevent recurrence of adverse incidents.

The Five-Day Written Report will be submitted within five (5) days of the time the District becomes aware of the noncompliance unless SWRCB staff or RWQCB staff waive the above described report if an oral report has been received within 24 hours.

8.8 Sampling Methods and Guidelines

The purpose of this section is to present methods and guidelines for the collection and analysis of samples necessary to meet the APAP objective of assessing adverse impacts, if any, to beneficial uses of water bodies treated with algaecides and aquatic herbicides.

This section describes the techniques, equipment, analytical methods, and quality assurance and quality control procedures for sample collection and analysis. Guidance for the preparation of this chapter included: NPDES Storm Water Sampling Guidance Document (USEPA 1992); Guidelines and Specifications for Preparing Quality Assurance Project Plans (USEPA 1980); Standard Methods for the Examination of Water and Wastewater, 22nd Edition (APHA 2012); and U.S. Geological Survey, National Field Manual for the Collection of Water Quality Data (USGS 1995).

8.8.1 Surface Water Sampling Techniques

As discussed in **Element 8.3**, if the water depth is 6 feet or greater the sample will be collected at a depth of 3 feet. If the water depth is less than 6 feet, the sample will be collected at the approximate mid-depth. Sampling staff will use an intermediary sampling device such as a sampling pump with tubing set to specific depths for water quality monitoring. Tubing will be cleaned using a non-phosphate cleaner (e.g., Liquinox), flushed with deionized water or distilled water, and then flushed with ambient site water prior to sample collection at a different depth and/or location. Alternative intermediary sampling devices like a Van-Dorn style sampler or long-handled sampling pole may be used to collect monitoring samples from the target depth. Long-handled sampling poles with attached sampling container will be inverted before being lowered into the water to the desired sample depth, where it will be turned upright to collect the sample.

During collection, the samples will be collected in a manner that minimizes the amount of suspended sediment and debris in the sample. Surface water grab samples will be collected directly by the sample container, or by an intermediary container. Intermediary samplers will be HDPE, stainless steel, glass, or other suitable material. Any container that will be reused between sites will be cleaned thoroughly and triple rinsed before collection of the next sample, as discussed in **Element 8.8.4**. Alternatively, disposable poly or glass intermediary sample containers may be used.

8.8.2 Sample Containers

Clean, empty sample containers with caps will be transported in manner that prevents contamination. The containers will be certified clean by either the laboratory or the container supplier. To ensure data quality control, the sampler will utilize the appropriate sample container as specified by the laboratory for each sample type. Sample container type, holding time, and appropriate preservatives are listed in **Table 2**. Each container will be affixed with a label indicating a discrete sample number for each sample location.

8.8.3 Sample Preservation and Filtering

Samples may either be collected an intermediary sampling device and poured into bottles containing the correct preservative(s), or collected in unpreserved bottles and preserved upon receipt at the analytical lab, as necessary. If filtration is required, it must be done prior to sample preservation. After collection, samples will be stored in a cooler with ice and transported to the analytical laboratory. Once at the laboratory samples will be analyzed or refrigerated at approximately four (4) degrees Celsius. Refer to **Table 2** for details on method bottle requirements, filtration and hold times.

8.8.4 Sampling Equipment Cleaning

In the event that sampling equipment will be used in more than one location, the equipment will be thoroughly cleaned with a non-phosphate cleaner, rinsed with distilled water, and then triple-rinsed with the water being sampled prior to collecting samples at a new location.

8.8.5 Sample Packing and Shipping

All samples are to be packed and transported the day the samples are collected, when feasible, to provide ample time for samples to be analyzed within the required holding time.

Ice will be included in coolers containing samples that require temperature control. Samples will be packaged for transport in the following manner:

1. Sample container labels will be checked for secure attachment to each sample container.
2. The sample containers will be placed in the cooler. If shipping glass bottles, bubble-wrap will be placed between sample containers to protect the sample containers from breakage during shipment and handling.
3. The Chain of Custody (COC) will be placed inside a plastic bag and placed inside the cooler, and taped to the cooler lid. The COC will be filled out consistent with **Element 8.9.4** with unique sample name, time and location, the sample collector, matrix type, the required analysis, number of containers, turn-around-time, and person(s) to which data will be reported.
4. The cooler will then be readied for pick-up by a courier.

8.9 Field Sampling Operations

8.9.1 Field Logbook

A 3-ring binder, bound logbook or other suitable recording media will be maintained by members of the sampling team to provide a record of sample location, significant events, observations, and measurements taken during sampling. Sample records are intended to provide sufficient data and observations to enable project team members to reconstruct events that occurred during the sampling and must be legible, factual, detailed, and objective. As appropriate and at the discretion of the District field staff, observations and measurements can be supplemented with pictures of site conditions at the time of sampling.

When recording observations in the field book, the sampling team will note the presence or absence of:

1. Floating or suspended matter;
2. Discoloration;
3. Bottom deposits;
4. Aquatic life;
5. Visible films, sheens, or coatings;
6. Fungi, slimes, or objectionable growths; and
7. Potential nuisance conditions.

See **Figure 4** for the forms to be used to record relevant field data when sampling.

8.9.2 Alteration of Sampling Techniques

It is possible that actual field conditions may require a modification of the procedures outlined herein. Specifically, water levels, weather, other environmental parameters and/or safety hazards including stream flow, rainfall, and irrigation water use may pose access and/or sampling problems. In such

instances, variations from standard procedures and planned sampling locations and frequencies will be documented by means of appropriate entry onto the datasheets/field forms.

8.9.3 Flow Estimation

Flow estimation measurements must be made for all flowing water sampling locations. If feasible, a flow meter calibrated according to the manufacturer's directions may be placed as close to the center of the stream, creek or canal as possible and a reading taken in feet per second (ft/sec). Alternatively, a common floating object (ball, branch, leaf, etc.) may be placed as close to the center of the conveyance as possible and the time it travels a known distance will be estimated and represented in ft/sec. A minimum travel distance of approximately 25 feet will be used. For non-flowing water bodies such as Stafford Lake, water flow is recorded as 0 ft/sec.

8.9.4 Chain-of-Custody (COC)

The COC record will be employed as physical evidence of sample custody. The sampler will complete a COC record to accompany each sample from the field to the laboratory. The COC will specify: time, date, location of sample collection, container type and total number, requested analysis, sampler name, required turn-around-time (if applicable), time and date of sample transaction between field and laboratory staff, preservative and filtration, if any, and name of receiving party at the laboratory.

Corrections to the COC will be made by drawing a line through, initialing, and dating the error, indicating the reason and entering the correct information. Erasures are not permitted.

Upon receipt of the samples, laboratory personnel will check to confirm that there is evidence of cooling and upon verification of the number and type of samples and the requested analysis, a laboratory representative will sign the COC, indicating receipt of the samples.

Upon sample delivery, the original copy will be left with the laboratory and a copy will be kept by the sampler, three-hole punched, and placed in the field logbook.

8.9.5 Sample Label

The label will contain information on the specific project (e.g., North Marin Water District APAP), the unique individual sample ID (e.g., Copper - BG), the location (e.g., Lake Stafford), and the date and time the sample was collected.

Prior to sampling, a waterproof label will be filled out completely with indelible ink and will be affixed to the appropriate container.

8.9.6 Corrections to Documentation

Documents will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement or correction. If an error is made on a document used by an individual, that individual will make corrections by making a line through the error, date, initial and give reason for error and entering the correct information.

8.9.7 Document Control and Retention

A central file location will be established and used to store documentation such as the filed logbook and laboratory data. Information related to sampling, analysis, equipment calibration, applications and reporting will be retained for at least three (3) years, or as extended upon request from the SWRCB.

8.9.8 Sample Kit

Prior to departing to the field to collect samples, the following equipment will be prepared for use:

- Laboratory-supplied sampling bottles (one set for each sample to be collected plus spares, plus QA/QC samples, if applicable)
- Sample labels (one for each sample to be collected plus spares)
- Sharpie-type pen or other permanent, waterproof ink marker (indelible ink)
- Chain of Custody forms
- Dissolved Oxygen Meter
- Field logbook with field forms
- Deionized or distilled water
- Ice or ice packs
- Cooler for samples
- Long-handled sampling pole or Van-Dorn style sampler
- Latex or nitrile gloves
- Rubber boots
- Camera

8.10 Quality Assurance and Quality Control (QA/QC)

The purpose of quality assurance and quality control (QA/QC) is to assure and control the quality of data generated during sample collection and analysis as described earlier in this document. Quality assurance and quality control are measured in a variety of ways, as described below.

8.10.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. It is a quantitative measure of the variability of a group of measurements compared to the average value of the group and is expressed as the relative percent difference (RPD). Sources of error in precision (imprecision) can be related to both laboratory and field techniques. Specifically, lack of precision is caused by inconsistencies in instrument setting, measurement and sampling techniques, and record keeping.

Laboratory precision is estimated by generating analytical laboratory matrix spike (MS) and matrix spike duplicate (MSD) sample results and calculating RPD. Laboratory control spike (LCS) and laboratory control spike duplicate (LCSD) may be prepared and RPD calculated in addition to or in lieu of the MS/MSD. In general, laboratory RPD values of less than 25% will be considered acceptable.

Field precision is estimated by collecting field duplicates (FDs) in the field and calculating RPD. In general, field RPD values of less than 35% will be considered acceptable. Refer to the discussion of FDs in **Element 8.10.5**.

8.10.2 Accuracy

Accuracy is a measure of how close data are to their true values and is expressed as percent recovery (%R), which is the difference between the mean and the true value expressed as a percentage of the true value. Sources of error (inaccuracy) are the sampling process, field contamination, preservation, handling, sample matrix effects, sample preparation, analytical techniques, and instrument error.

Laboratory accuracy is estimated using reference standards, matrix spike (MS) and matrix spike duplicates (MSD) samples, and laboratory control spike (LCS) and laboratory control spike duplicate (LCSD) samples. Acceptable accuracy is generally between 75 and 125%. Refer to the earlier discussion of MS/MSD and LCS/LCSD.

8.10.3 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness objective is that the sufficiently valid data is generated to allow for submittal to the SWRCB and RWQCB. Completeness will be assessed by comparing the number of valid sample results to the number of samples collected. The objective for completeness is $\geq$ 80 %.

8.10.4 Representativeness

Representativeness refers to a sample or group of samples that reflects the predominant characteristics of the media at the sampling point. The objective in addressing representativeness is to assess whether the information obtained during the sampling and analysis represents the actual site conditions.

8.10.5 Field Duplicate

The purpose of a field duplicate (FD) is to quantify the precision, or reproducibility, of the field sampling technique. It involves the duplication of the technique used for a particular field sample collection method and the subsequent comparison of the initial and duplicate values. This comparison is measured as the RPD. RPD is calculated as follows:

RPD = [(Sample1 – Sample2) / (Average of Samples 1 and 2)] X 100

An acceptable field RPD value is $\leq$ 35%.

The FD is collected at the same time as the actual field sample and one FD per year per active ingredient per environmental setting will be collected.

8.10.6 Field Blank

The purpose of the field blank (FB) is to assure that the field sampling technique, equipment, or equipment cleaning technique or materials do not impart a false positive or negative result during the collection of the sample. A FB will be prepared with distilled water and allowed to come into contact with the sampling device in a manner identical to the actual sample. The only acceptable value for analytes in the FB is less

than the detection limit for the compounds of interest, or an expected, previously determined, background value.

The FB will be collected at the same time as the actual field sample and one FB per year per active ingredient per environmental setting will be collected.

8.10.7 Laboratory Quality Assurance and Quality Control

Laboratory precision and accuracy will be monitored by a series of laboratory-generated quality control samples. As long as sufficient sample volume is collected and submitted to the laboratory, no additional effort is required by field activities to generate laboratory quality control samples. Each set of field samples will have associated with it one each from the following set of laboratory quality control samples.

8.10.7.1 Method Blank

The purpose of the method blank (MB) is to assure that the analytical technique does not impart a false positive result during the preparation or analysis of the sample. A method blank will be prepared by the laboratory from high purity distilled or deionized water. The only acceptable values for analytes in the MB are zero or an expected, previously determined, BG values.

8.10.7.2 Matrix Spike

The purpose of a matrix spike (MS) is to quantify accuracy and to assure that the analytical technique does not impart a false negative or positive result during the preparation or analysis of the sample. It involves the introduction of the analyte (or an analyte surrogate) of interest into the actual sample matrix and then quantitating it.

The amount detected divided by the amount added to the matrix is expressed as a %R. Acceptable values of %R range from 75% to 125% for most analyses. Percent recovery is calculated as follows:

$$\%R = [(\text{Spike Amount Detected} - \text{Sample Value}) / \text{Amount Spiked}] \times 100$$

8.10.7.3 Matrix Spike Duplicate

The purpose of a matrix spike duplicate (MSD) is to quantify laboratory precision. An acceptable RPD is less than or equal to 25% for most analyses. The MSD involves duplication of the MS resulting in two data points from which the RPD is calculated as follows:

$$RPD = [(MS - MSD) / (\text{Average of MS and MSD})] \times 100$$

8.10.8 Data Validation

Data validation will use data generated from the analytical laboratory and the field. References that can be used to assist in data validation include USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994) and USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 1999).

The purpose of data validation is to ensure that data collected are of sufficient quality for inclusion in reports to the RWQCB. In order to serve this purpose, the following information must be available in order to evaluate data validity:

1. Date of sample collection – required to uniquely identify sample and holding time.
2. Location of samples – required to identify sample.
3. Laboratory QA/QC procedures – required to assess analytical accuracy, precision, and sample integrity. A laboratory QA/QC sample set typically consists of a MS, MSD, and MB. A laboratory QA/QC sample set will be analyzed by the laboratory for each field sample batch. Sufficient sample volume and number will be supplied to the laboratory in order to prepare and evaluate the laboratory QA/QC sample set.
4. Analytical methods – required to assess appropriateness and acceptability of analytical method used.
5. Detection limits – required to assess lower limit of parameter identification.
6. Holding times, preservation, and dates of extraction and analysis – required to assess if a sample was extracted and analyzed within the specified time limits and if a sample was stored at the appropriate temperature.
7. Field QA/QC procedures – required to assess field precision and sample integrity. A field QA/QC sample set consists of FB and FD samples. A field QA/QC sample set will be analyzed by the laboratory for one sampling event per year. Sufficient sample volume and number will be collected in the field and supplied to each laboratory in order to prepare and evaluate the field QA/QC sample set.

8.10.9 Data Qualification

Data collected for compliance with the Permit will be qualified through the Analytical Lab Validation process described in **Element 8.10.7**. This process will ensure all data has been thoroughly reviewed and qualified as valid. During the data validation process, data qualifiers will be used to classify sample data. The following qualifiers will be used:

A - Acceptable. The data have satisfied each of the requirements and are quantitatively acceptable (i.e., valid) and will be used in reports.

R - Reject. Data not valid. This qualifier will be used for samples that cannot be uniquely identified by date of collection or sample location or that fail holding time or detection limit requirements. Invalid data will not be presented in reports submitted to the RWQCB.

8.10.10 Corrective Action

If previously described criteria for valid data are not met, then corrective action as follows will be taken:

1. The laboratory will be asked to check their quality assurance/quality control data and calculations associated with the sample in question. If the error is not found and resolved, then:

    a. The extracts or the actual samples, which will be saved until the data are validated, will be reanalyzed by the laboratory if they are within holding time limitations. These new results will be compared with the previous results. If the error is not found and resolved, then:
    b. If field analytical equipment is used, then calibration records will be reviewed. If the error is not found, then:
    c. The sampling procedure and sample preparation will be re-checked and verified. If the procedures appear to be in order and the error is not resolved, then:

d. The data will be deemed invalid and not used.

2. Upon discovery of the source of an error, every attempt will be made to address the cause of the error and remedy the problem.

8.10.11 Data Reporting

The results of sampling and analysis will be summarized in the Annual Report. The data will be tabulated so that they are readily discernible.

Element 9: Procedures to Prevent Sample Contamination

Sample collection will not be done in close proximity to application equipment and preferably upwind. Sampling will be done in a manner that prevents contact with algaecide application equipment, containers, or personal protective equipment (PPE). Care will be taken by samplers to minimize contact with any treated water, vegetation, or application equipment.

In the event that sampling equipment will be used in more than one location, the equipment will be thoroughly cleaned, triple-rinsed uncontaminated water, and then rinsed once with the water being sampled prior to its first use at a new sample collection location, as described in **Element 8.8.4**. Gloves will be changed between sites.

Element 10: Description of BMPs

The District employs the following BMPs to ensure the safe, efficient and efficacious use of algaecides and aquatic herbicides.

10.1 Measures to Prevent Spills and Spill Containment in the Event of a Spill

Applicators take care when mixing and loading algaecides and adjuvants. All label language is followed to ensure safe handling and loading of algaecides. Application equipment is regularly checked and maintained to identify and minimize the likelihood of leaks developing or failure that would lead to a spill. Applications to Lake Stafford are made using boats; mixing and loading occurs at the boat launch with closed system when possible and if compatible with the product being applied. Spill and cleanup equipment will be kept in good working order and readily available at the mixing and loading site.

If algaecides or aquatic herbicides are spilled, they will be prevented from entering any waterbodies to the extent practicable. District and application contractor staff are trained to contain any spilled material and are familiar with the use of absorbent materials such as kitty litter, “pigs,” and “pillows.” Spills will be cleaned up according to label instructions, and all equipment used to remove spills will be properly contained and disposed of or decontaminated, as appropriate. Applicators will report spills as required by local, state or federal policy and in a manner consistent with local, state and federal requirements.

10.2 Measures to Ensure Appropriate Use Rate

The following BMPs help ensure the appropriate algaecide and/or aquatic herbicide application rate is used.

10.2.1 Site Scouting

Prior to treatment, the District conducts extensive monitoring of water quality and algae in the lake. The District's PCA and/or qualified District staff scout the lake to evaluate the extent to which algae thresholds have been exceeded. Thresholds are described in **Element 5** and include reduction of production capacity limitations, or detection of potential toxin producing species. Algae and/or aquatic weed population size, density or biomass is often considered in the determination of appropriate product use rates.

If the lake is deemed to have exceeded a threshold, or a given algae population is anticipated to exceed a threshold based on known water quality, algal density, weather conditions, or other information, an algaecide application is considered. If the application can be made without negatively impacting the water quality, then an application is made.

10.2.2 Written Recommendations Prepared by PCA

Prior to application, a PCA licensed by DPR and/or qualified District staff or qualified application contractor scout the area(s) to be treated, makes a positive identification of pest(s) present, checks applicable product label(s) for control efficacy, and the PCA prepares a written recommendation, including rates of application, and any warnings or conditions that limit the application so that non-target flora and fauna are not adversely impacted. Licensed PCAs must complete 40 hours of continuing education every 2 years to stay licensed, and therefore are up-to-date on the latest techniques for pest control.

10.2.3 Applications Made According to Label

All algaecide applications are made according to the product label in accordance with regulations of the USEPA, CalEPA, Cal/OSHA, DPR, and the local Agricultural Commissioner. The District's PCA and DPR-licensed Qualified Applicator Certificate (QAC) or Qualified Applicator License (QAL) holders regularly monitor updates and amendments to the label so that applications are in accordance with label directions. Licensed QALs and QACs must complete 20 hours of continuing education every 2 years to stay licensed, and therefore are up to date on the latest techniques for pest control.

10.2.4 Applications Made by Qualified Personnel

As appropriate, consistent with applicable regulations, the District or its application contractor will utilize QALs, QACs or staff under the supervision of QALs or QACs to make applications or supervise applications recommended by the PCA. The District's application contractor has knowledge of proper equipment loading, nozzle selection, calibration, and operation so that spills are minimized, precise application rates are made according to the label, and only target plants are treated.

10.3 The Discharger's plan in educating its staff and herbicide applicators on how to avoid any potential adverse effects from the herbicide applications

See information above on the continuing education requirements of District or application contractor staff responsible for selection and application of algaecides and aquatic herbicides.

10.4 Application Coordination to Minimize Impact of Application on Water Users

At least 15 days prior to the first algaecide application of each year, the District will deliver a notification letter to the Marin County Agricultural Commissioner, the California Department of Fish and Wildlife Bay-Delta Region, the US Fish and Wildlife Service, and the National Marine Fisheries Service. Any other affected public agencies or individuals will be added to the notification letter distribution list as they are identified. If required by the algaecide product label, water users potentially affected by any water use restrictions will be notified prior to an application being made. No farmers receive water directly from any of the potentially treated waterbodies.

10.5 Description of Measures to Prevent Fish Kills

It is important to acknowledge that the use of algaecides, even when used according to label instructions, may result in unavoidable fish kills. Nonetheless, measures will be taken to reduce the likelihood of fish kills as described below. Generally speaking, the concentration of residual algaecides (i.e., the concentration of the algaecide present after the treatment is complete) is not sufficiently high to result in fish kills. Low DO due to decomposition of decaying algae can adversely affect non-target species like fish.

10.5.1 Applications Made According to Label

All algaecide applications are made according to the product label in accordance with regulations of the USEPA, CalEPA, DPR, Cal/OSHA and the local Agricultural Commissioner. Precautions on the product label to prevent fish kills will be followed. For example, limitations on the total water volume treated will be followed to prevent dead algae from accumulating and then decaying and subsequently depressing the DO level. Depressed DO may adversely impact fish populations.

10.5.2 Written Recommendations Prepared by PCA

Prior to application, a PCA licensed by DPR, District and/or application contractor staff scouts the area to be treated, makes a positive identification of pest(s) present, checks applicable product label(s) for control efficacy, and in collaboration with District staff, the PCA prepares a written recommendation, including rates of application, and any warnings or conditions that limit the application so that fish are not adversely impacted.

10.5.3 Applications Made by Qualified Personnel

As appropriate, consistent with applicable regulations, the District and/or application contractor will utilize QALs, QACs or staff under the supervision of QALs or QACs to make applications or supervise applications recommended by the PCA. The District and/or application contractor have knowledge of

proper equipment loading, calibration, and operation so that spills are minimized, precise product use rates are applied according to the label, and appropriate water concentration is achieved to control the target algae being treated.

Element 11: Examination of Possible Alternatives

11.1 Evaluation of Other Management Options

Evaluating alternative control techniques is part of the District's IPM approach and therefore alternative treatment measures are considered as part of the management options for algae control in Lake Stafford. Prior to making the decision to control algae with an algaecide, the District evaluates other available management options. These options are considered based on the impact to water quality, impact to non-targeted organisms like plants, fish or reptiles, potential efficacy, feasibility, and cost effectiveness. In general, alternative control techniques can be expensive, labor intensive, less effective, and cause temporary water quality degradation.

When the population of aquatic weeds equals or exceeds a threshold that could adversely affect drinking water quality or clog filters at treatment plants, management options are evaluated. Possible options that are considered may include additional sampling or investigation of the problem, implementing operational, mechanical, or cultural controls consistent with the District's IPM techniques.

11.1.1 No Action

As feasible, this technique is used. While no control action may be taken at this time, District staff conducts routine monitoring of the lake. The regular surveillance of conditions in Stafford Lake allow the District to monitor algae populations and inform decisions regarding thresholds where a control action may be needed. Prior to reaching a threshold, no control is considered.

The District is not interested in stopping all algal growth or blooms, but to focus on preventing impacts to treatment plant operations. The presence of non-problem algae may be a benefit as they are likely occupying an overlapping niche and directly competing with the problem algae species.

11.1.2 Prevention

Sediment Dredging

In areas where sedimentation has significantly impacted the capacity of the water body, dredging can increase the water volume, reduce organic matter generated in the water body, and remove nutrient-containing sediment. Dredging would not provide a substantial benefit to reduced internal nutrient loading. It will be considered in the future for select areas if removal of sediment accumulation may help prevent release of nutrients available to fuel algal growth.

Aeration and Mixing

Aeration, oxygenation and mixing are methods that can mechanically add oxygen directly to the water and can result in the reduction of nuisance algal growth. Aeration is currently used to reduce anoxia in

the hypolimnion of Stafford Lake and provide water movement to discourage algal growth. The current compressor-based aeration system was recently doubled in 2021 to have a total of 8 compressors, located in the deepest section, approximately 25% of the lake. The aeration system has helped maintain near 100% dissolved oxygen saturation under normal conditions, reducing potential for remobilization of nutrients in the lake sediment. During an algae bloom in 2022, the aeration system maintained about 20% saturation at the intake tower when it would have likely been near 0% saturation without aeration.

The District installed five Solar Bees® in the lake to circulate water and reduce algal growth habitat in 2004. The Solar Bees® are intended to prevent the water column from stratifying, increase water movement within the lake, and suppress algal blooms. District staff determined that the units are marginally effective at mitigating algal blooms in Stafford Lake.

Reduction of Light

The application of dye products to reduce sunlight penetration of the water column can reduce aquatic plant and algae growth by limiting their ability to photosynthesize. This control method may be effective at reducing aquatic vegetation and algae issues at Stafford Lake.

Similarly, reservoir covers limit algal production by limiting the light that is necessary for algal growth. Covering the lake with available technology is infeasible for many reasons, including its size and shape, ecosystem services and habitat benefits it provides, and to continue providing recreational opportunities to the community.

Nutrient Management

Nutrient management involves limiting the introduction of or reducing existing levels of nutrients in water that support aquatic vegetation and algae growth.

The District has conducted a watershed survey of the potential nutrient or contaminate inputs around the lake. Based on this, areas of erosion were identified and repaired to prevent contributions of nutrient-containing sediment from entering the lake. The District has also installed sedimentation basins downstream of culverts around the lake to capture nutrient-containing sediment in stormwater or irrigation runoff. These sediment basins are then dredged out to prevent then nutrients from entering the lake. The fertilizers used at the golf course to the south of the lake go through a review and approval process with the District and may require implementation of specific BMPs to ensure that the products do not add nutrients to the lake that could fuel algae growth.

Waterfowl excrement is a contributor to nutrient levels in the lake. Waterfowl species are attracted to the lake's natural features and by the well-meaning people who feed them. Feeding wildlife or waterfowl in a manner that disrupts their normal behavior patterns is illegal and prohibited by California Code of Regulations Title 14, section 251.1. The District may discourage park users and residents from feeding by posting signs prohibiting waterfowl feeding and a public education program through social media or display boards at beaches and parks, to educate the public as to why the waterfowl should not be fed. If necessary, a waterfowl removal or egg addling program can be instituted with the cooperation of California Department of Fish and Wildlife if the carrying capacity of the lake and surrounding habitat is exceeded. This may include treating eggs in the nests, hunting and/or a capture and euthanasia system and can be an effective strategy for reducing the number of resident waterfowl. It is important to gain public support for this type of wildlife management before implementation. Also, as new individuals will continually migrate to the site, it is important to pair this waterfowl control method with habitat

modification and waterfowl hazing options that include, but are not limited to, fencing, tall vegetation and/or native ground cover, noise making devices and trained dogs (Maslo 2013).

Installation of floating islands with roots that extend into the water column that are capable of taking up nutrients has been considered as a technique to remove nutrients from the water column in the some waterbodies. The plants growing in the artificial islands remove nutrients that would otherwise be used by aquatic plants or algae. The islands can also act as a habitat for terrestrial and aquatic species and pollinator-friendly plants. Challenges and limitations with this approach include impacts to aesthetics of the lake, island maintenance and harvesting necessary to remove nutrients from the system, and ineffectiveness on nutrients in sediment. The removal rate of nutrients from the lake by floating islands is low and any benefit would be localized to the root zone of the plants. As a result, installation of floating islands is not expected to make a significant change in the amount of nutrients available.

Removal of phosphorus from the water column is an alternative approach to nutrient management. This approach to nutrient management can be accomplished applying phosphorus-binding agents like alum or Phoslock®, which strip phosphorus from the water column as they sink to the bottom and into sediment. Products like Phoslock can be applied at high rates to create a sediment "cap", intended to prevent future nutrient release and internal nutrient loading in the lake. Challenges with this approach include the need to obtain a permit from the RWQCB, the cost of the product, and the need to collect water and sediment samples to determine the application rate. In addition, phosphorus in the sediment will be minimally or un-affected with alum or at low application rates of Phoslock.

Native Species Establishment

No appropriate native plants or acceptable algae species are available that could be put in Stafford Lake to out-compete nuisance algae for nutrients in the water column without creating similar challenges.

11.1.3 Mechanical or Physical Methods

Mechanical Removal

Mechanical removal of algae in the lake is not feasible. While floating mats of filamentous algae or submersed aquatic weeds can be removed from the water column using methods like hand-pulling, use of motor-driven aquatic harvesters to pull up and remove vegetation or algal mats, and aquatic weed-whacking or mowing, non-matted algae is too small to be controlled by mechanical removal. Mechanical harvesting can be used for minimal removal of algae but is only practical when there is a thick algal scum. Additionally, mechanical harvesting cannot be used for benthic algae, which may be the source of some problematic algae blooms in the lake.

Ultrasonic Control

Devices exist that emit ultrasonic waves at certain frequency and claim to disrupt and/or kill algae cells. These devices have not shown to be effective in large-scale settings and would likely be limited in influence on algae in Stafford Lake due to its shape and size.

11.1.4 Cultural Methods

Cultural control refers to practices that reduce pest establishment, reproduction, dispersal, and survival. One of the most important cultural methods is prevention, discussed in **Element 11.1.2** above.

Control Method Timing

Modifying the timing of algaecide and aquatic herbicide and non-herbicide controls to prevent plants from reaching reproductive growth stages can reduce the amount of aquatic herbicides used. This includes making applications before the biomass of algae or aquatic vegetation is high enough to require higher algaecide or aquatic herbicide application rates, a larger application area, or additional applications to maintain algae or aquatic weed populations below threshold levels.

Water Level Manipulation & Selective Withdrawal

Decreasing the water level in the lake causes the shallower areas of the lake to dry out, effectively preventing the aquatic vegetation and algae in those areas from impacting plant operations. As needed, the District can take water into the plant from different elevations on the intake tower. For example, if a benthic algae bloom is causing filter clogging, the District may change the intake depth to a higher elevation where benthic algae is not drawn into the plant.

11.1.5 Biological Control Agents

Herbivorous Fish

Stocking of herbivorous fish like triploid grass carp has been successful against some submersed aquatic plants in freshwater systems. These fish prefer to eat submersed aquatic plants, not algae. Additionally, strict limitations on issuance of permits by CDFW would likely prevent stocking of triploid grass carp in Stafford Lake. As such, this option is not a suitable alternative control.

Bio-manipulation

Bio-manipulation utilizes various natural mechanisms that can reduce algae and involves modifying the ratio of prey and predator species present to increase predation on algae in the lake. The biological controls are typically done by top-down or bottom-up changes to the food-web structure aimed at increasing populations of algae-consuming zooplankton. Bio-manipulation may be more efficient when used in conjunction with other habitat modification methods. However, this technique is also very difficult to institute and maintain in large lakes and reservoirs. Additional challenges with environmental permitting fish stocking make biomanipulation infeasible to implement in Stafford Lake.

There are no known biological control agents that can reliably and effectively control significant algal blooms.

11.1.6 Algaecides and Aquatic Herbicides

The selection of and decision to use an algaecide or aquatic herbicide is based on the recommendation of a PCA in collaboration with District staff or its qualified application contractor. The PCA may consider a

variety of control options that may include mechanical and cultural techniques that alone or in combination with chemical controls are the most efficacious and protective of the environment.

Evaluating alternative control techniques is part of the District's IPM approach; therefore, an alternative treatment may be selected as part its program. In general, alternative control techniques are expensive, labor intensive, not as effective, and/or may cause temporary water quality degradation. The equipment and labor required to perform these techniques is not always readily available. This may cause delays in control or removal leading to increased quantities of plant material to remove, and subsequently higher removal cost.

The quantity or rate of algaecide and/or aquatic herbicide required for an application is determined by a PCA that has followed the label directions in making a recommendation. The rate at which an algaecide and aquatic herbicide is used is highly variable and depends on the type, time of year, location, density, and historical growth patterns of aquatic weeds or algae, water presence, and goal of the application. All of these factors are considered by the PCA prior to making a recommendation for an application.

11.2 Using the Least Intrusive Method of Aquatic Herbicide Application

The District may use a variety of application equipment, but applications are generally made using one to three boats. Boats may be used to apply algaecides by making broadcast applications using a spreader, handgun or submersed boom to apply granules or liquids. Combined with the need to hold, safely transport and properly apply algaecides, the methods used to apply algaecides to Stafford Lake are the least intrusive, feasible option.

Please refer to **Table 1** for application methods.

11.3 Applying a Decision Matrix Concept to the Choice of the Most Appropriate Formulation

As previously stated, a PCA and/or qualified District staff scout the area(s) to be treated, identifies the target algae(s) present, checks appropriate algaecide product label(s) for efficacy information, and then the PCA prepares a written recommendation. The written recommendation includes rates of application, and any warnings or conditions that limit the application.

The PCA may also recommend that an adjuvant be used to enhance the efficacy of the algaecide.

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