Aquatic Pesticide Application Plan

Pescadero Reclamation District 2058

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

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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:

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Pescadero Reclamation District 2058

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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
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Table of Contents

List of Tables

List of Figures

Limitations

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List of Abbreviations

AHAL	Aquatic Herbicide Application Log
APAP	Aquatic Pesticide Application Plan
BG	Background Monitoring
BMPs	Best Management Practices
^{o}C	Degrees Celsius
Cal-EPA	California Environmental Protection Agency
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
COC	Chain of Custody
CTR	California Toxics Rule
District	Pescadero Reclamation District 2058
DO	Dissolved Oxygen
DPR	California Department of Pesticide Regulation
Event	Event Monitoring
FB	Field Blank
FD	Field Duplicate
ft/sec	Feet per Second
HDPE	High Density Polyethylene
IPM	Integrated Pest Management
MB	Method Blank
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 States Environmental Protection Agency
VOA	Volatile Organics Analysis
WDID	Waste Discharge Identification

Aquatic Pesticide Application Plan

In March 2001, the State Water Resources Control Board (SWRCB) prepared Water Quality Order # 2001-12-DWQ which created Statewide General National Pollutant Discharge Elimination System (NPDES) Permit # CAG990003 for the discharges of aquatic herbicides to waters of the United States**.** The purpose of Order # 2001-12-DWQ was to minimize the areal extent and duration of adverse impacts to beneficial uses of water bodies treated with aquatic herbicides. The purpose of the general permit was to substantially reduce the potential discharger liability incurred for releasing water treated with aquatic herbicides into waters of the United States. The general permit expired January 31, 2004.

On May 20, 2004, the SWRCB adopted the statewide general NPDES Permit for Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States #CAG 990005. Dischargers were required to have the general permit to perform aquatic herbicide applications. In May 2009, the general permit expired, but was administratively continued until November 30, 2013.

The Statewide General 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 available on December 1, 2013 (SWRCB 2013). The Permit expired November 30, 2018, and it has been admiratively 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 Policy, or SIP (SWRCB 2005)
- The California Toxics Rule (CTR)
- Applicable Regional Water Quality Control Board (RWQCB) Basin Plan Water Quality Objectives (RWQCB 2019), and
- Permit-defined Receiving Water Limitations (RWLs) or Receiving Water Monitoring Triggers (RWMTs)

Coverage under the Permit is available to dischargers that are responsible for resource or pest management activities, including private or public local, state, and federal entities. Dischargers control the financing for these activities, or make decisions related to the implementation of pest management activities like applying algaecides or aquatic herbicides. These may be used to control algae, aquatic weeds, and other organisms that adversely impact operation and use of many different types of waterbodies including drinking water reservoirs, water conveyance facilities, irrigation canals, storm drainage or flood control channels, detention basins and/or natural waterbodies. The Permit regulates the discharge of residual algaecides and aquatic herbicides applied in accordance with label directions and registered for use at aquatic sites by the California Department of Pesticide Regulation (DPR).

Pescadero Reclamation District 2058 (referred to herein as the "District") is located southwest of the City of Lathrop and Paradise Cut and northeast of the City of Tracy in San Joaquin County. Pescadero Reclamation District is responsible for the operation and maintenance of nearly 11 miles of levees and 14 miles of the Tom Paine Slough, which protect approximately 8,000 acres of agricultural, residential, commercial, and industrial land. Refer to **Figure 1** and **Figure 2**.

The District was formed on November 21, 1928 for the purposes of drainage, levee maintenance, and water distribution for irrigation. The riparian and pre-1914 appropriative water rights for the land were transferred to the District by an individual and are still used today to provide irrigation water to its constituents, many of whom cultivate crops.

Efficient irrigation and drainage conveyance is critical to the functions of the District. However, the presence of aquatic weeds in the Tom Paine Slough can reduce the channel capacity and flow of water within the slough, impacting delivery of water to the recipients. As such, the District intends to obtain coverage to apply aquatic herbicides to its conveyances using the Permit to control nuisance aquatic vegetation.

Using Integrated Pest Management (IPM) techniques, the District intends to apply algaecides and/or aquatic pesticides 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 Bowman in conjunction with the District that describes the project, the need for the project, what will 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 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 or 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, 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.

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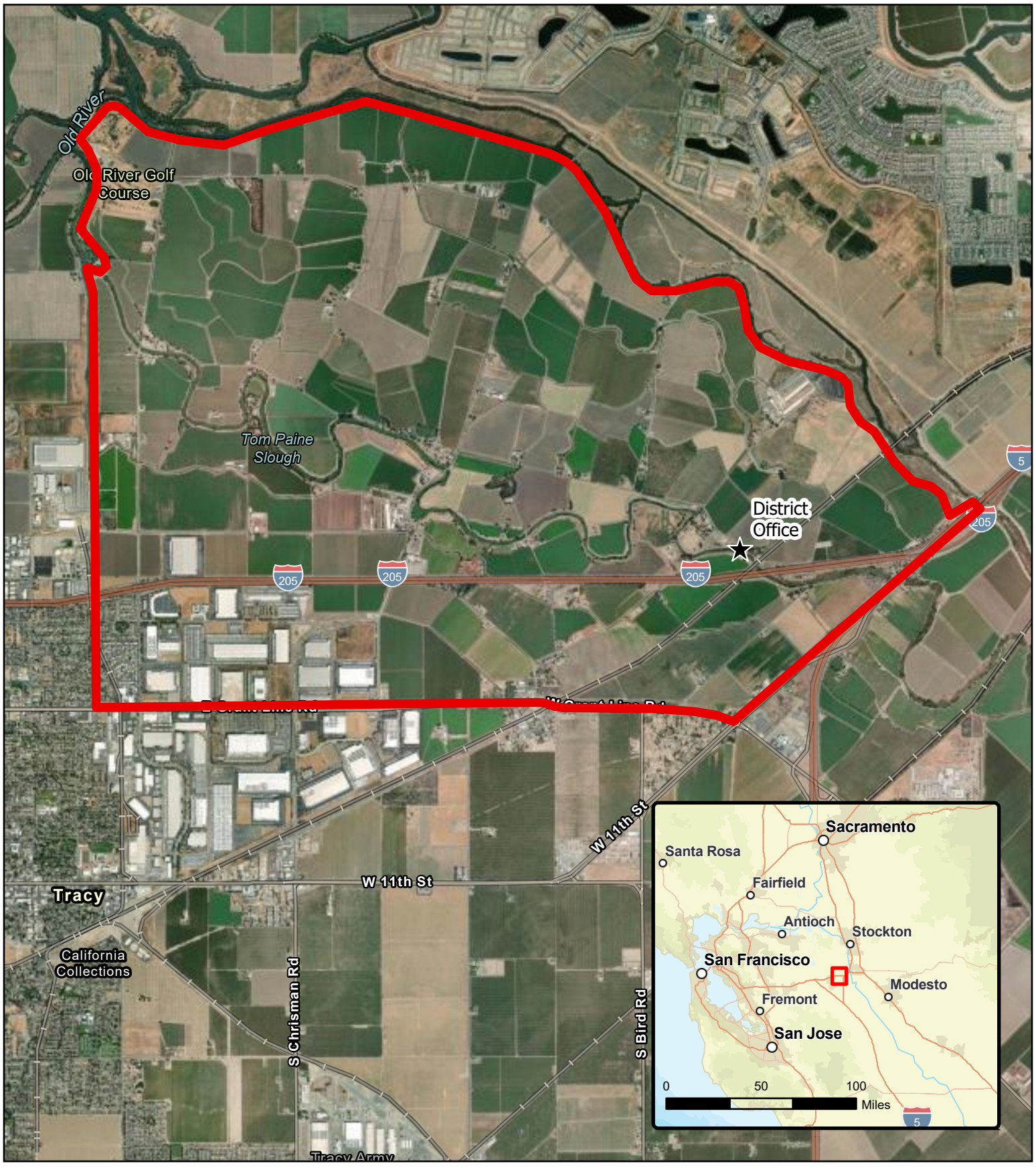
Overview of RD 2058
Tracy, CA

Figure 1

District Boundary

0 0.5 1
Miles



Element 1: Description of the Water System

The District is bordered by Sugar Cut to the west and Paradise Cut to the north. Tom Paine Slough, which is a natural flood channel of the San Joaquin River, is the District's primary source of irrigation water. River and agricultural development has cut Tom Paine Slough off from the San Joaquin River in the east. In the west, Tom Paine Slough breaks off from the Old River north of Tracy. Water is diverted into Tom Paine Slough via four siphons and/or two box culverts located at 37.790341, -121.418656. Water from Tom Paine Slough is then pumped by the District at 8 pump stations into District irrigation ditches that then serve the agricultural land within the District.

Return drainage is discharged into District drainage ditches and is then either pumped into Paradise Cut or drains naturally back into Tom Paine Slough. Return drainage can only enter Paradise Cut if it is pumped into Paradise Cut via the District's drain pumps. (See **Figure 2**)

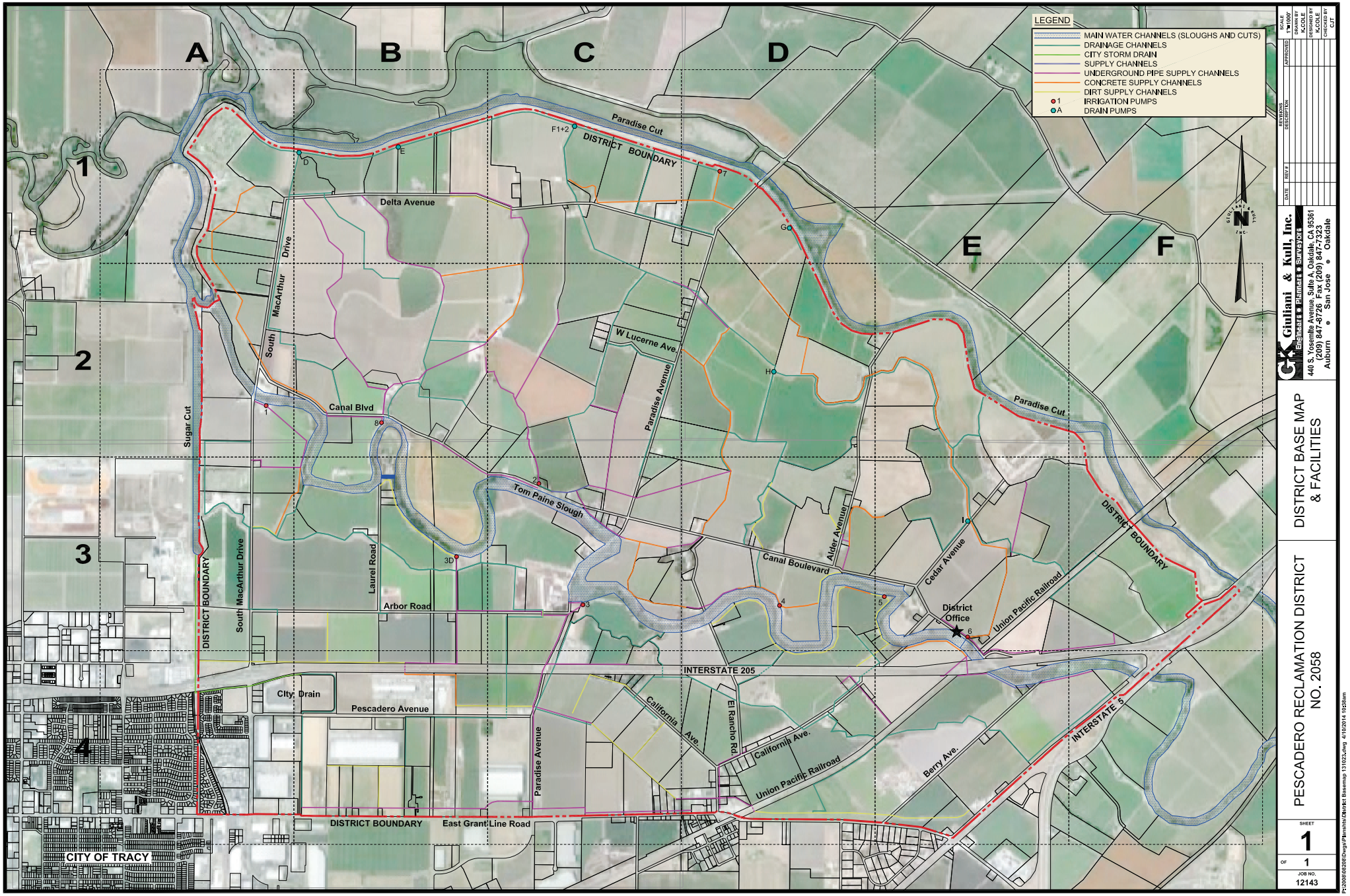
Paradise Cut generally returns water back to Tom Paine Slough. However, return water from Paradise Cut may also discharge a portion of volume further down Old River where it can either collect into Clifton Court Forebay for use in the State Water Project or move into the CW Bill Jones Pumping Plant to be lifted into the Delta Mendota Canal.

Sugar Cut, Paradise Cut, and Tom Paine Slough can collectively be considered part of the Sacramento San Joaquin Delta, and therefore have the following beneficial uses: municipal and domestic supply (MUN), irrigation and Stock Watering (AGR), industry process (PROC), industry service supply (IND), contact recreation (REC-1), non-contact recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), warm and cold migration (MIGR), warm spawning (SPWN), wildlife habitat (WILD), and navigation (NAV).

Element 2: Description of the Treatment Area

Application and treatment areas will be within the Tom Paine Slough. Tom Paine Slough has a surface area of roughly 90 acres of water and ranges in depths of 2 to 4 feet. The target treatment area will be the west side of Tom Paine Slough which has a surface area of approximately 45 acres of water and is the deepest part of the Slough. All areas within the slough where aquatic vegetation meets treatment thresholds are subject to treatment. See **Figure 2** for a detailed map of potential treatment areas.

Figure 2



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DISTRICT BASE MAP & FACILITIES

PESCADERO RECLAMATION DISTRICT NO. 2058

SHEET 1 OF 1

JOB NO. 12143

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Element 3: Description of Weeds

Weeds found in Tom Paine Slough include emergent, floating, and submerged aquatic vegetation and algae. Vegetation in Tom Paine Slough includes, but is not limited to, common water-hyacinth (*Eichhornia crassipes*), water primrose (*Ludwigia* spp.), common duckweed (*Lemna minor*), cattail (*Typha* spp.), sago pondweed (*Stuckenia pectinata*), Brazillian waterweed (*Egeria densa*), and filamentous and planktonic algae.

Efficient conveyance of irrigation and irrigation return drainage is critical to the District. Tom Paine Slough is prone to severe infestation by floating weeds such as waterprimrose and common water-hyacinth. The presence of these weeds can slow or stop the flow of water in Tom Paine Slough, thus preventing delivery of irrigation water to a field, or impacting drainage in the District.

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

Table 1: Aquatic Herbicides That May Be Used

Herbicide	Application Method(s)	Adjuvant	Degradation Byproducts
Copper (Chelated)	Boom, injection, or handgun sprayer	Various aquatic-labeled adjuvants	None, persists as various speciations of copper[1]
Copper Sulfate	Slug application, spreader, or via submersed burlap sack	Not Applicable	None, persists as various speciations of copper[1]
Diquat Dibromide	Boom or handgun sprayer	Various aquatic-labeled adjuvants	No major degradates[2]
Endothall	Injection, handgun or boom sprayer, or spreader (granules)	Not Applicable	Endothall acid, potassium ions, coco-alkylamine[3]
Flumioxazin	Boom or handgun sprayer.	Various aquatic-labeled adjuvants	TPHA, A-TPA, 482-HA, 482-PHO, PHO-HA, APF, and SAT-482-HA-2[4]
Fluridone	Boom or handgun sprayer, or spreader	Not Applicable	N-methtyl Formamide[5]
Glyphosate	Backpack sprayer, handgun, boom sprayer, or drone application	Various aquatic-labeled adjuvants	Aminomethyl phosphonic acid (AMPA), carbon dioxide[6]
Hydrogen Peroxide[7]	Handgun, boom sprayer, injection	Various aquatic-labeled adjuvants	Water and oxygen
Imazamox	Backpack sprayer, handgun, boom sprayer, or drone application	Various aquatic-labeled adjuvants	Nicotinic acid and imazamox parent chemicals[8]
Imazapyr	Backpack sprayer, handgun, or boom sprayer, or drone application	Various aquatic-labeled adjuvants	Pyridine hydroxy-dicarboxylic acid, pyridine dicarboxylic acid, and nicotinic acid[9]
Penoxsulam	Backpack sprayer, handgun, or boom sprayer	Not Applicable	11 major and 2 minor degradates[10]
Peroxyacetic Acid	Handgun, boom sprayer, injection	Various aquatic-labeled adjuvants	Oxygen, carbon dioxide, water, and acetic acid[11]

Sodium Carbonate Peroxyhydrate	Handgun, boom sprayer (liquid), or spreader (granules)	Not Applicable	Sodium carbonate, water, and oxygen[12]
Triclopyr	Backpack sprayer, handgun, boom sprayer, or drone application	Various aquatic-labeled adjuvants	3,5,6-trichloro-2-pyridinol (TCP)[13]

Notes:

[1] USEPA 2009

[2] USEPA 1995

[3] Endothall-containing herbicides are formulated as either endothall dipotassium salt or N,N-dimethylalkylamine salt. Both formulations produce endothall acid as a degradation byproduct along with corresponding cation components (potassium ions and coco-alkylamine for the dipotassium salt and N,N-dimethylalkylamine formulations, respectively). (USEPA 2005)

[4] Major flumioxazin degradants include: 3,4,5,6-tetrahydrophthalic acid (THPA); 3,4,5,6-Tetrahydrophthalic acid anhydride (A-TPA); 7-Fluoro-6[(2-carboxy-cyclohexenoyl)amino]-4-(2-propynyl)-1,4-benzoxazin-3(2H)-one (482-HA); N-(2-propynyl)-4-[4-carboxy-3-fluoro-2-(3,4,5,6-tetrahydrophthalimido)-2-butenylidene]azetidine-2-one (482-PHO); N-(2-propynyl)-4-[4-carboxy-3-fluoro-2-(2-carboxy-1-cyclohexencarbonylamino)-2-butenylidene]azetidine-2-one (PHO-HA); 6-Amino-7-fluoro-4-(2-propynyl)-1,4,-benzoxazin-3(2H)-one (APF); and (1S,2S)-2-{[7-fluoro-3-oxo-4-(prop-2-yn-1-yl)-3,4-dihydro-2H-1,4-benzoxazin-6-yl]carbamoyl} cyclohexanecarboxylic acid (SAT-482-HA-2) (EFSA et al. 2020).

[5] 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).

[6] USEPA 1993-A

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

[8] The major degradant in the environment is CL 354,825 (Nicotinic acid, 5-hydrody-6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl). Other metabolites include AC 312,622 (demethylated parent with intact ring structures and two carboxylic acid groups) and AC 354,825 (demethylated, decarboxylated parent with intact rings and one carboxylic acid group) (USEPA 2008).

[9] USEPA 2006

[10] Major degradants include: BSA, 2-amino-TP, TPSA, BSTCA, BSTCA methyl, 2-amino-TCA, 5-OH-penoxsulam, SFA, sulfonamide, 5,8-di-OH and 5-OH 2 amino TP. Minor degradants include: di-FESA and BST. (USEPA 2007).

[11] USEPA 1993-B

[12] USEPA 2002

[13] USEPA 1998

As needed or recommended, aquatic-labeled adjuvants may be used to enhance the efficacy of an aquatic herbicide or algaecide. Generally, the District uses adjuvants that are not nonylphenol-based.

All herbicide applications are made in accordance with the product label. For example, an application of glyphosate and an appropriate surfactant to a drainage channel may be made with a boom sprayer calibrated to deliver the correct amount of material per acre treated to achieve the desired coverage to control target vegetation.

Element 5: Discussion of Factors Influencing Herbicide Use

Treatment of aquatic vegetation and algae by the District is determined by the application of Integrated Pest Management (IPM). For example, if a population of weeds equals or exceeds a threshold, an aquatic pesticide application is made. Thresholds are met when weeds cause problems in either the slough or irrigation and drainage conveyances, typically associated with impediments to flow or sediment build-up in District channels within the annual treatment period.

Aquatic pesticide applications may also be made prior to threshold exceedance. For example, based on predicted growth rate and density, historical weed trends, weather, water availability, and experience, weeds may reasonably be predicted to cause future problems. Accordingly, they may be treated soon after emergence or when appropriate based on the pesticide to be used. Even though weeds may not be an immediate problem at this phase, treating them before they mature reduces the amount of aquatic pesticide needed because the younger weeds are more susceptible and there is less plant mass to target. Generally, treating weeds earlier in the growth cycle results in less total pesticide used. Selection of appropriate aquatic pesticide(s) and rate of application is done based on the identification of the weed, its growth state and the appearance of that weed on the product label as a plant it controls.

The selection of and decision to use an aquatic pesticide is based on the recommendation of a California Department of Pesticide Regulation (CDPR)-licensed Pest Control Advisor (PCA). The PCA considers 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 IPM approach; therefore an alternative treatment may be selected as part of a test program. An alternative control technique includes mechanical removal (harvesting in the lake, or chaining in channels). A more detailed description is presented in **Element 11** of this document.

In general, alternative control techniques are expensive, labor intensive, not as effective, and may cause temporary water quality degradation. The equipment and labor required to perform these techniques is not always readily available as the removal is required during a busy general maintenance period for the District. This may cause delays in removal leading to increased plant material to remove and increased cost.

Element 6: Gates and Control Structures

Water from Tom Paine Slough is used to irrigate the fields around the system before being recycled back into the system through District drain ditches or manually pumped into Paradise Cut via the pump in Paradise Cut. To evaluate the presence of discharge, the pump location will be inspected prior to and during the application. The Aquatic Herbicide Application Log (AHAL, **Figure 3**) is the form used to document this inspection. If the pump is on and water is being discharged, it will be stopped immediately.

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

The Permit allows the District to apply for a SIP Section 5.3 Exception for a short-term or seasonal exception to the dissolved copper or acrolein RWL. If an exception is granted, this section will be amended to describe the exception period as outlined in the required California Environmental Quality Act (CEQA) documentation.

The District does not currently have a SIP exception, nor does it plan to use acrolein-containing materials. If it becomes evident that a SIP exception will be needed to comply with the Permit under the current management plan for the use of copper-containing materials, the District will explore the option for procuring a SIP exception.

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 residual aquatic herbicides discharge cause an exceedance of the receiving water limitations?
>
> Question No. 2: Does the discharge of residual 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 aquatic herbicide applications at all sites and be recorded by qualified personnel.

Figure 3 (Aquatic Herbicide Application Log) or its equivalent, **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 (F°) _____ 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 (F°) _____

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 for glyphosate will be conducted for one application event from each environmental setting, flowing water and non-flowing water, per year if applications are made. For application of all other aquatic herbicide active ingredients listed on the Permit, 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.

If the results from six consecutive sampling events show concentrations that are less than the applicable RWLs or RWMTs in an environmental setting, the District will reduce the sampling frequency for that active ingredient to one per year in that environmental setting. If the annual sampling shows exceedances of the applicable RWL/RWMT, the District will be required to return to sampling six applications the next year, and until sampling may be reduced again.

Sites will be chosen to represent the variations in treatment that occur, including aquatic herbicide use, hydrology, and environmental setting, conveyance or impoundment type, seasonal, and regional variations. The exact location(s) of sample site(s) will be determined after site scouting and a decision to make an algaecide or aquatic herbicide application are made per the District's IPM approach. **Appendix 2** includes the forms used to document sampling.

8.2.1 Sample Locations

Sampling will include background, event, and post-event monitoring as follows:

Background Monitoring: In moving water, the background (BG) sample is collected upstream of the treatment area at the time of the application event, or in the treatment area within 24 hours prior to the start of the application.

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

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 several factors including, but not limited to aquatic weed density and type, flow rates, discharge from the treatment site, 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 (i.e., BG, Event and Post) will be collected during each treatment from the representative site(s) treated within District waterbodies according to the monitoring frequency and locations described earlier.

Additionally, one Field Duplicate (FD) and one Field Blank (FB) will be collected and submitted for analysis for each analyte, once per year. The FD and FB samples are typically collected during Event

Monitoring if water is leaving the treatment area.

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 for locations that are difficult to access. 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. Appropriate cleaning techniques are discussed in Section 8.8.4.

8.4 Field Measurements

In conjunction with sample collection, temperature will be measured in the field. Turbidity, electrical conductivity, pH, and DO 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 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.

8.5 Sample Preservation and Transportation

Samples may be collected directly into preserved containers, or collected in unpreserved containers, and preserved at the laboratory upon receipt if the analytical method requires preservation. Once a sample is collected and labeled it will immediately be placed in a dark, cold environment, typically a cooler with ice maintained at four degrees Celsius (°C). Delivery to the laboratory should occur 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 chemical analysis is only required for the active ingredient(s) used in the treatment.

Table 2: Required Sample Analysis

Analyte	EPA Method	Reporting Limit	Hold Time (Days)	Container	Chemical Preservative
Temperature[1]	N/A	N/A	N/A	N/A	N/A
Dissolved Oxygen[1]	360.1 or 360.2	0.0 mg/L	1	Winkler bottle	None
Turbidity[2]	180.1	0.00 NTU	2	250 mL HDPE	None
Electrical Conductivity[2]	120.1	0 µS/cm	28	250 mL HDPE	None
pH[2]	150.1 or 150.2	1-14	Immediately	250 mL HDPE	None
Nonylphenol[3]	550.1m	0.5 µg/L	7	2 x 40 mL VOA	None
Hardness (dissolved)[4]	SM2340B	0.7 mg CaCO3/L	1 Day if unpreserved; 180 Days if preserved	250 mL HDPE	HNO_3
*Copper (dissolved)	200.8	0.5 µg/L	1 Day if unpreserved; 180 Days if filtered and preserved	250 mL HDPE	HNO3
*Diquat	549	5 µg/L	7	500 mL Amber HDPE	H_2SO_4 or none
*Endothall	548.1	5 µg/L	7	500 mL Amber Glass	None
*Fluridone	SePro FasTest, HPLC	1 µg/L; 5 µg/L	14	30 ml Amber HDPE or 2 40 mL VOA	None
*Glyphosate	547	0.5 µg/L	14	2 x 40 mL VOA	None
*Imazamox	HPLC	1.0 ug/L	14	2 x 40 mL VOA	None
*Imazapyr	532m	1.0 ug/L	14	2 x 40 mL VOA	None
*Penoxsulam	532m	20 ug/L	7	1 L Amber Glass	None
*Triclopyr	8151m, 8150A, 615	1.0 µg/L	7	2 40 mL VOA	None

Notes:

* Signifies algaecide or aquatic herbicide active ingredient. Chemical analysis is only required for the active ingredient(s) used in treatment. Active ingredient analysis not required for algaecides and aquatic herbicides containing sodium carbonate peroxyhydrate, peroxyacetic acid, and/or hydrogen peroxide; however, field parameters must still be measured and reported. EPA Methods are taken from NEMI 2004.

[1] Field measured.

[2] May be field or laboratory measured.

[3] Required for copper applications only.

[4] Dissolved copper samples are filtered using a 0.45 micron filter and stored at 4°C, and/or preserved with nitric acid (HNO_3).

H_2SO_4 – Sulfuric acid

HCl – Hydrochloric acid

HDPE – High density polyethylene

HNO_3 – Nitric acid

HPLC – High Performance Liquid Chromatography.

m – Modified extraction or analysis technique.

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 appropriate RWQCB. In years when no aquatic herbicides are used, a letter stating no applications will be sent to the appropriate RWQCB 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 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 applicable 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 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/quality control plan. Sampling results shall be tabulated so that they are readily discernible; and
9. Summary of AHALs.

The District will report to the SWRCB and appropriate RWQCB any noncompliance, including any unexpected or unintended effect of an 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 appropriate 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 United States Environmental Protection Agency (USEPA) pesticide registration number for each product the District 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 SWRCB and appropriate RWQCB 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. 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. Aquatic herbicide application rate, intended use site (e.g., banks, above, or direct to water), method of application, and name of herbicide product, description of herbicide ingredients, and U.S. EPA registration number;
6. Description of the habitat and the circumstances under which the noncompliance activity occurred (including any available ambient water data for 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 aquatic herbicides from the District's 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 Regional Water Board 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 aquatic herbicides.

This section describes the techniques, equipment, analytical methods, and quality assurance and quality control (QA/QC) 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); 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 Section 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. As necessary, an intermediary sampling device (e.g., Van-Dorn style sampler or long-handled sampling pole) will be used for locations that are difficult to access. 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. Appropriate cleaning technique is discussed in Section 8.8.4.

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 in the event that the sample container cannot be adequately or safely used. Intermediary samplers will be either poly (plastic/HDPE), stainless steel or glass. Any container that will be reused between sites will be washed thoroughly and triple rinsed before collection of the next sample, see Section 8.8.4. Alternatively, disposable poly or glass intermediary sample containers can be used.

8.8.2 Sample Containers

Clean, empty sample containers with caps will be supplied in protective cardboard cartons or ice chests by the primary laboratory. The containers will be certified clean by either the laboratory or the container supplier. 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. The label will also indicate the date and time of sampling and the sampler's name.

8.8.3 Sample Preservation and Filtering

As discussed in Section 8.3, samples may either be collected with bottles containing the correct preservative(s) or collected in unpreserved bottles and preserved upon receipt at the analytical lab. If filtration is required, it must be done prior to sample preservation. After collection, samples will be refrigerated at approximately 4°C, stored in a dark place, and transported to the analytical laboratory. Refer to **Table 2**.

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, triple-rinsed with distilled water, and then rinsed once with the water being sampled prior to its first use at a new sample collection location.

8.8.5 Sample Packing and Shipping

All samples are to be packed and transported the day the samples are collected 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 in the following manner:

1. Sample container stickers will be checked for secure attachment to each sample container.
2. The sample containers will be placed in the cooler. Bubble-wrap, suitable foam padding, or newspaper 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, typically taped to the underside of the lid. The COC will indicate each unique sample identification name, time and place of sample collection, the sample collector, the required analysis, turn-around-time, and location to which data will be reported.
4. The cooler will then be prepared for pick-up by a courier or delivered directly to the laboratory.

8.9 Field Sampling Operations

8.9.1 Field Logbook

A 3-ring binder or bound logbook will be maintained by members of the sampling team to provide a record of sample location, significant events, observations, and measurements taken during sampling. Observations and measurements should be supplemented with pictures of site conditions at the time of sampling if possible. Field logbooks are intended to provide sufficient data and observations to enable project team members to reconstruct events that occurred during the sampling. The field logbook entries will be legible, factual, detailed, and objective.

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 3** and **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 hazards including high flows, and rainfall 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 into the field forms.

8.9.3 Flow Estimation

A flow meter calibrated according to the manufacturer's directions will be placed as close to the center of the stream or creek as possible and a reading taken in feet per second (ft/sec). Alternatively, the time a common floating object (branch, leaf, etc.) travels a known distance will be estimated and represented in ft/sec. A minimum distance of approximately 25 feet will be used. Flow estimation measurements will be made for all moving water sampling locations.

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 shipment from the field to the laboratory. The COC will specify: time, date, location of sample collection, specific and unique sample number, requested analysis, sampler name, required turn-around-time, time and date of sample transaction between field and laboratory staff, preservative, 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, and entering the correct information. Erasures are not permitted.

Upon receipt of the samples, laboratory personnel will check to confirm that the contents of the ice chest(s) are accurately described by the COC. 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.

The COC record form will be completed in duplicate. 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 (i.e. Pescadero Reclamation District 2058), the unique individual sample ID (i.e. Tom Paine Slough – BG), the date and time the sample was collected, and the name of the sampler (i.e. Richard Pellegri).

Prior to sampling, a waterproof label will be completed with waterproof 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 and entering the correct information. The erroneous information will not be obliterated. Corrections will be initialed and dated.

8.9.7 Document Control

A central file location will be established and used to store documentation such as the filed logbook and laboratory data.

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)
- Sample labels (one for each sample to be collected plus spares)
- Sharpie® Pen or other permanent, water-proof ink marker
- Chain of Custody forms
- Field data logbook
- Flow meter (optional – for moving water applications)
- Zip lock style bags for paperwork
- Non-phosphate cleaner (i.e. Liqui-Nox®)
- Deionized or distilled water
- Ice or blue ice packs
- Clear Mailing Tape
- Cooler for samples
- Grab pole or Van-Dorn style sampler
- Gloves
- Rubber boots or waders
- Smartphone, stopwatch
- Camera

8.10 Quality Assurance and Quality Control

The purpose of QA/QC is to assure and control the quality of data generated during sample collection and analysis as described earlier in this document. QA/QC 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. In general, laboratory RPD values of less than 25% will be considered acceptable.

Field precision is estimated by collecting 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 Section 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, MS, and MSD samples. Acceptable accuracy is generally between 75 and 125% and varies based on the analytical laboratory and analysis. Refer to the earlier discussion of MS and MSD.

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 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 an 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 will be collected per active herbicidal ingredient.

8.10.6 Field Blank

The purpose of the FB is to ensure 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 will be collected per active herbicidal ingredient.

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. An MB 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, background values.

8.10.7.2 Matrix Spike

The purpose of a 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 %R. Acceptable values of %R range from 75% to 125%. %R is calculated as follows:

%R = [(Spike Amount Detected - Sample Value) / Amount Spiked] x 100

8.10.7.3 Matrix Spike Duplicate

The purpose of an MSD is to quantify laboratory precision. An acceptable RPD is less than or equal to 25%. The MSD involves duplication of the MS resulting in two data points from which RPD is calculated as follows:

RPD = [(MS – MSD) / (Average of MS and MSD)] X 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 confirm 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 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 consists of a MS, a MSD, and a 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 Section 8.10.7. This process requires that 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 QA/QC 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 aquatic pesticide application equipment, containers, or personal protective equipment (PPE). Care will be taken by samplers to minimize contact with any treated water or vegetation.

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, 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 Section 8.8.4. Gloves will be changed between sites.

Element 10: Description of BMPs

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

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

Applicators take care when mixing and loading aquatic herbicides and adjuvants. All label language is followed to allow safe handling and loading of aquatic herbicides. Application equipment is regularly checked and maintained to identify and minimize the likelihood of leaks developing or failure that would lead to a spill. If possible, aquatic herbicides will be mixed and loaded at a contained location with no exposure to aquatic environments before leaving for the application site(s).

If aquatic herbicides are spilled, they will be prevented from entering any water bodies to the extent practicable. The District 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 the District’s policy and in a manner consistent with local, state, and federal requirements.

10.2 Measures to Ensure Appropriate Use Rate

Application of aquatic herbicides will be conducted by individuals who are or are supervised by individuals who are considered qualified applicators by DPR. Examples of qualified staff include those who have a Qualified Applicator Certificate (QAC) or Qualified Applicator License (QAL). Holders of QAC or QAL, or those under their direct supervision, make applications recommended by the PCA. These applicators have 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 vegetation is treated. Calibration allows the applicator to check the application rate to confirm that the correct quantity and rate of aquatic herbicide is applied.

10.2.1 Site Scouting

Prior to treatment, the District's PCA and/or qualified staff scout sites to evaluate the extent to which acceptable aquatic weed thresholds have been exceeded. Maintenance activities in Tom Paine Slough are focused on reducing nuisance conditions, maintaining water flow conditions, and odor concerns. As such, thresholds are based on growth stage and density of vegetation that would create or contribute to nuisance conditions.

If a location is deemed to have exceeded a threshold or given aquatic weed or algae population is anticipated to exceed a threshold based on site and weather conditions, historic aquatic weed/algae growth, or other information, an aquatic herbicide/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 scout the area(s) 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 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 aquatic herbicide applications are made according to the product label in accordance with regulations of the U.S. EPA, CalEPA, California Occupational Safety and Health Administration (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 will utilize QALs, QACs or District staff under the supervision of QALs or QACs to make applications or supervise applications recommended by the PCA. These District staff have 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 staff responsible for selection and application of aquatic herbicides.

10.4 Application Coordination to Minimize Impact of Application on Water Users

As required by the aquatic herbicide label, water users potentially affected by any water use restrictions will be notified prior to an application being made. If control structures are constructed in the future, those control structures will be closed to prevent discharge of residual aquatic herbicides.

10.5 Description of Measures to Prevent Fish Kills

It is important to acknowledge that the use of aquatic herbicides, 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 aquatic herbicides (i.e., the concentration of the aquatic herbicide present after the treatment is complete) is not sufficiently high to result in fish kills.

10.5.1 Applications Made According to Label

All aquatic herbicide applications are made according to the product label in accordance with regulations of the U.S. EPA, California EPA (Cal-EPA), DPR, OSHA and the local Agricultural Commissioner. Precautions on the product label to prevent fish kills will be followed. For example, limitations on the surface water area treated will be followed to prevent dead aquatic weeds 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 and/or District 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 will utilize QACs, QALs, or District staff under the supervision of QALs or QACs to make applications or supervise applications recommended by the PCA. These applicators have 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 vegetation is treated. Calibration ensures that the correct quantity and rate of herbicide is applied.

Element 11: Examination of Possible Alternatives

11.1 Evaluation of Other Management Options

Treatment of aquatic weeds is determined by the application of IPM. For example, if a population of aquatic weeds equals or exceeds a threshold, an aquatic herbicide application is made. Thresholds are met when aquatic weeds cause problems, typically associated with capacity, flow impediment, or sediment build-up.

Aquatic herbicide applications may also be made prior to threshold exceedance. For example, based on predicted growth rate and density, weather, water availability, and historical records and experience, aquatic weeds may reasonably be predicted to cause future problems. Accordingly, they may be treated soon after emergence. Even though aquatic weeds may not be an immediate problem at this phase, treating them before they mature reduces the amount of aquatic herbicide needed because the younger aquatic weeds are more susceptible and there is less plant mass to target. Selection of appropriate aquatic herbicides and rate of application is done based on the identification of the aquatic weed and the appearance of that aquatic weed on the product label.

11.1.1 No Action

As feasible, this technique is used. For example, consistent with the IPM program used by the District, a threshold is typically reached prior to treatment. Prior to reaching a threshold, no control is considered.

11.1.2 Prevention

Habitat Modification

After the removal of non-native terrestrial and emergent invasive species, the introduction and re-establishment of native species has been successful along the banks or margins of streams and rivers in some cases. See discussion below under *Native Species Establishment*.

The District will also consider other habitat modifying techniques appropriate for localized areas; for example, dredging. In areas where sedimentation has significantly impacted the capacity of the waterbody, dredging can increase the water volume and remove nutrient-containing sediment. The District will have to obtain the proper permits to perform any sediment excavation.

Native Species Establishment

No appropriate submersed aquatic native plants have been found to establish within lakes or reservoirs to out compete aquatic weed species and not create similar or other operational problems. As such, submersed aquatic vegetation in District waterbodies may need to be controlled using other approaches to maintain the aquatic weed density tolerances established by the District.

After the removal of emergent non-native or invasive species, the introduction and re-establishment of native species has been successful along the banks or margins of lakes, streams and rivers. This technique provides competition for non-desirable species, creates habitat, and may reduce the long-term need for emergent aquatic weed abatement. Limitations to this approach include availability of suitable native species, availability of labor to plant native species, and irrigate and cultivate until the native plant stand is established, and safe access to banks for work crews. Plant characteristics such as growth patterns and the potential to invade areas where they are not wanted must be considered as well as the timing for successful planting of native plants. This technique is expensive, takes multiple years to grow-in and establish, may be subject to additional regulatory approval depending on the site and methods (i.e., California Department of Fish and Wildlife, Corps of Engineers, etc.), and may not be feasible in all areas. Further, establishment of native vegetation like blue elderberry shrubs may impair efforts at aquatic weed control due to restrictions on what can be done to or around them as they could be potential habitat for the Valley elderberry longhorn beetle.

11.1.3 Mechanical or Physical Methods

Mechanical Removal

Mechanical removal in the District's static water system requires various methods including the use of hand or motor-driven cutting tools or removing weeds with an excavator. Generally, these techniques are very labor intensive per unit acre or length of water treated. Mechanical removal places personnel at risk of general water, slip, trip and fall hazards, poisonous wildlife, drowning, risks the spilling of motor oil and fuel, and can increase air pollution. The cost per area of mechanical removal is significantly higher than the cost of labor, product, and equipment for the application of aquatic herbicides. The increased cost of mechanical aquatic weed abatement does not include the cost of the aforementioned risks (pollution abatement, workman's compensation claims, etc.).

In some instances, the use of mechanical techniques may be necessary when the use of aquatic herbicides is not practical, or vegetation is not at an appropriate growth stage. Bowman estimates that mechanical removal is 10 to 25 times more expensive than using chemical controls. This additional expense does not include the cost for disposal or for obtaining permits.

Environmental impacts due to the use of mechanical techniques include the creation of water-borne sediment and turbidity due to people and equipment working in the water. This suspended sediment can adversely affect aquatic species by lowering DO and preventing light penetration. Disturbing sediment or conveyance banks may cause additional problems including, but not limited to, new areas for aquatic weed establishment, fragmentation and re-establishment of aquatic weeds, and siltation. Many species the District hopes to control can be spread through fragmentation, and mechanical control has the potential to increase the distribution of the problem vegetation. Waste must be spoiled on-site and can create nuisance conditions as it dries out.

Mechanical removal has been and will continue to be used by the District, as feasible, to remove vegetation in some areas. While effective in the short-term, regrowth or reemergence of vegetation is common.

Floating Booms

Floating plants like water hyacinth have the potential to block inflow and outflow to Tom Paine Slough. Installation of floating booms at select locations set back in front of the inflow and outflow structures can reduce or prevent clogs and blocking of water flow. Booms also provide the opportunity to treat concentrated mats of floating aquatic vegetation with aquatic herbicides or remove plants with an excavator. Floating booms can be a control method that can be considered to assist with management of floating aquatic weeds.

Drone Spraying

Using Unmanned Aerial Vehicles (UAVs), such as drones, to apply pesticides can allow applicators to make precise applications and reduce input costs. Drones will also assist the District to apply pesticides on floating weed mats in areas that cannot be easily accessed and areas that are too far for a boom sprayer or hand-held sprayer to reach. The District plans to hire an Aerial Applicator with the appropriate licenses to handle this task.

Controlled Burns

This option is only suitable for some types of emergent and terrestrial weeds and is not appropriate for floating or submerged aquatic vegetation. This option is not a suitable alternative control method for vegetation management in Tom Paine Slough. Additionally, controlled burns create air quality concerns and have not been feasible in most years due to restrictions by the air quality management district.

Grazing

This option is most suitable for emergent and terrestrial weeds and is not suitable for floating or submerged aquatic weeds. Impacts to water quality from animal feces, increases in turbidity, nutrients, and bank erosion, and impacts to desirable species make this option unfeasible in some cases. The cost of hiring grazing animals is also generally more costly than chemical control alternatives. The nature of the conveyance system, location within a municipality, potential access issues, and lack of fencing limits where grazing could be implemented within the system make this a difficult option to implement.

11.1.4 Cultural Methods

Cultural methods used to reduce the volume of aquatic herbicides used include modifying the timing of aquatic herbicide and non-herbicide controls to prevent plants from reaching reproductive growth stages. Another cultural method is making applications before the density of aquatic vegetation is high enough to require higher aquatic herbicide application rates or additional applications to maintain aquatic weed populations below threshold levels.

Included methods will also have to take account of the Streambed Alteration Agreement pursuant with Fish and Game Code section 1602 which states that in order to protect nesting birds, all chemical control and physical/mechanical control activities must be conducted between July 1 and March 1. If work is

required outside of this window, then a pre-project nest survey will be conducted by a CDFW-approved biologist within 15 days prior to the beginning of authorized maintenance activities.

11.1.5 Biological Control Agents

Goats and sheep are often used for grazing in and along riparian areas and levees. See discussion above in Section 11.1.3, *Grazing*.

11.1.6 Aquatic Herbicides

The selection of and decision to use an aquatic herbicide is based on the recommendation of a PCA in collaboration with District staff. The PCA considers 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. Alternative control techniques and detailed description of each of these is presented in Section 11.1. In general, alternative control techniques are expensive, labor intensive, not as effective, and may cause temporary water quality degradation. The equipment and labor required to perform these techniques is not always readily available as it is required during the summer months that is typically a busy general maintenance period for the District. This may cause delays in removal or sporadic plant material activity leading to increased plant growth and subsequently higher plant material removal cost.

The quantity of 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 aquatic herbicide is used is highly variable and depends on the type, time of year, location, and density and type of aquatic weeds, water presence, and goal of the application. All 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 plans to use a variety of application methods including drone spraying and personnel with backpack sprayers to make aquatic herbicide applications. Combined with the need to hold, safely transport, and properly apply aquatic herbicides, the District's techniques are the least intrusive as feasibly possible.

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 scouts the area to be treated, makes a positive identification of pest(s) present, checks appropriate aquatic herbicide product label(s) for control efficacy, 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 aquatic herbicide.

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