CALIFORNIA DEPARTMENT OF PARKS AND RECREATION, DIVISION OF BOATING AND WATERWAYS

EDCP Aquatic Pesticide Application Plan

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1. Introduction

On March 5, 2013 the California State Water Quality Control Board approved the General National Pollutant Discharge Elimination System (NPDES) permit for Aquatic Pesticide Use (General Permit No. CAG990005, Water Quality Order No. 2013-0002-DWQ). The NDPES permit requires dischargers to complete an Aquatic Pesticide Application Plan (APAP), which contains the following elements:

1. Description of the water system to which aquatic pesticide being applied;
2. Description of the treatment area in the water system;
3. Description of what weed(s) are being controlled and why;
4. Aquatic herbicide products or types of 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 aquatic pesticides application for weed control;
6. If applicable, list the gates or control structures to be used to control the receiving waters potentially affected by 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 an exception, describe the exception period. If weeds are also controlled outside of this period, how is it ensured that receiving water criteria is not exceeded;
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 BMPs to be implemented
11. Examination of possible alternative methods of control.

2. Water System for Aquatic Pesticide Application

Egeria densa Control Program Area

The Egeria Densa Control Program (EDCP) project area includes the Sacramento-San Joaquin Delta, its tributaries, and the Suisun Marsh. An area map of the Sacramento-San Joaquin Delta, its tributaries, and the Suisun Marsh is provided in **Appendix 1**. CEQA requires that the project description identify the precise location and boundaries of the proposed project. The California Department of Parks and Recreation, Division of Boating and Waterways (DBW) uses the legal definition of the Sacramento-San Joaquin Delta, as contained in Section 12220 of the California Water Code, in determining its scope of responsibility for the EDCP.

The Sacramento-San Joaquin Delta (the Delta) and its tributaries form the lowest part of the Central Valley, lying between the Sacramento and San Joaquin rivers and extending from the confluence of the two rivers inland as far as Sacramento and Stockton. Covering approximately 738,000 acres, the Delta is interlaced with hundreds of miles of waterways. The EDCP covers an eleven-county region encompassing much of the Delta and upland tributaries. The eleven counties include: (1) Alameda, (2) Contra Costa, (3) Fresno, (4) Madera, (5) Merced, (6) Sacramento, (7) San Joaquin, (8) Solano, (9) Stanislaus, (10) Tuolumne and (11) Yolo. All proposed sites where aquatic pesticides are applied are located in the Delta and its tributaries within the following general boundaries:

- ❒ West up to, and including, Sherman Island, at the confluence of the Sacramento and San Joaquin Rivers;
- ❒ West up to the Sacramento Northern Railroad, to include water bodies north of the southern confluence of the Sacramento River and Sacramento River Deep Water Ship Channel;
- ❒ North to the northern confluence of the Sacramento River and Sacramento River Deep Water Ship Channel, plus waters within Lake Natoma;
- ❒ South along the San Joaquin River and Kings River to Mendota, just east of Fresno;
- ❒ East along the San Joaquin River to Friant Dam on Millerton Lake;
- ❒ East along the Tuolumne River to La Grange Reservoir, below Don Pedro Reservoir; and
- ❒ East along the Merced River to Merced Falls, below Lake McClure.

Suisun Marsh

AB 2193 specified that the DBW should undertake an aggressive program to control *Egeria* in the Sacramento-San Joaquin Delta, its tributaries, and the Suisun Marsh. However, at the time of the establishment of the EDCP EIR there have been no observations of *Egeria* reported in the Suisun Marsh, and it is believed not to grow there. It is likely that a brackish water condition in the Marsh prohibits *Egeria* growth. The DBW has elected not to include the Suisun Marsh in the EDCP at this time because *Egeria* is not expected to occur in, or infest, the Marsh.

3. Target Species for Control

Description of Egeria densa

Egeria densa (*Egeria*, also known as Brazilian Elodea) is a non-native submerged aquatic weed that grows throughout the Delta. The plant is native to Southeast Brazil. *Egeria* in its non-native habitat has few natural predators because it was introduced from Brazil disease and insect-free. The spread of *Egeria* outside its native range has been attributed to the fact that it was once considered an important "oxygenator" for ponds and aquaria, and thus became widely available as an aquarium plant (Cook and Urmi-Konig, 1984).

Stems of *Egeria* usually are one foot to two feet long, but can be much smaller or larger. *Egeria*'s small leaves are strap-shaped, about one-inch-long and ¼-inch wide. The leaf margins have very fine saw teeth that require a magnifying lens to see. *Egeria* has dense whorls of three to six bright green leaves arranged around the stem. Flowers are on short stalks about one inch above the water. Flowers have white petals and are about ¾ inch across.

Egeria reproduces asexually, or vegetatively, through fragmentation. In this process, severed plant fragments regenerate into new plants capable of establishing themselves at new locations. Part of the widespread success of the plant is due to its ability to reproduce in this manner.

Need for Control

Egeria has spread uncontrolled since it was first introduced to the Delta several decades ago. *Egeria* may have spread to the Delta when an aquarium was dumped or when a boater carried it into Delta waters from an infested area. Factors that have caused *Egeria* to spread through the Delta include ideal weather and hydrologic conditions and the lack of natural controls (e.g., competing species, herbivores, and pathogens). *Egeria* appears to grow in spurts with the fastest growth likely occurring during periods of drought.

Dense mats of *Egeria* that form in the Delta are a hazard and nuisance because they can:

- ❑ Eliminate or hinder boat and vessel navigation
- ❑ Disrupt recreational activities such as water skiing, fishing, and swimming
- ❑ Clog agricultural irrigation intakes
- ❑ Slow water conveyance, requiring increased energy costs to pump water
- ❑ Displace native plant communities
- ❑ Upset balance of the aquatic environment
- ❑ Accelerate sedimentation in important shallow-water fish habitats.

DBW Jurisdiction, CEQA, and ESA/CESA Compliance

Assembly Bill 2193 (AB 2193, Rainey, signed September 23, 1996, became law January 1, 1997) designated the DBW as the lead agency to develop a control program for *Egeria densa* in the Sacramento-San Joaquin Delta, its tributaries, and the Suisun Marsh. As a result of this legislative authority, the DBW established the EDCP.

Before the program could be implemented a comprehensive EDCP EIR was drafted and submitted for public review and comment. Additionally, biological opinions were issued to fulfill Endangered Species Act requirements were obtained from the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS). The EDCP EIR was finalized March 2001 and the program was first implemented in the summer of 2001.

4. Control Tolerances

The Delta contains approximately 67,779 water surface acres, of which an estimated 15% of waterbody surface acres, are infested with *Egeria. Egeria* biomass (i.e., the volume of *Egeria*) varies throughout the Delta based on the channel depth and the level of infestation. Sites are ranked and prioritized based on the degree of navigational impairment. Those with serious impairment are ranked highest. At certain sites, the DBW determined that some of the infested acreage is not critical to control for navigation.

The DBW conducts periodic on-site field surveys to assess *Egeria* infestation at treatment sites. The DBW uses field surveys and hydroacoustic mapping to assess levels of *Egeria* infestation for each site in the Delta. Field surveys at each Delta site allow the DBW to develop more accurate estimates of the *Egeria* infestation acreage that actually interferes with navigation. These field surveys use a Geographic Information System (GIS) system (i.e., linking field observations to coordinates).

5. Aquatic Pesticides in Regards to Control Tolerances

The DBW has divided the Delta and tributaries into zones (generally within west, north, central and south). The areas are further divided into sites. Sites vary in size, and may be between one and three miles in length. Each application crew works throughout the year to control the sites contained in their assigned area. *Egeria treatments* can occur within 418 possible treatments sites throughout the Delta and its tributaries, based on where it is observed and the degree of infestation. Maps showing the 418 possible treatment sites are provided in **Appendices 2 and 3**. To the best extent possible, treatments will be planned using a combination of current field observations, prior infestation history, and DBW staff knowledge.

The DBW uses a structured decision-making process to determine which sites it treats. The DBW uses a methodology for determining the potential control methods it uses and how control results are monitored. **Appendix 4** identifies the process and outcomes associated with each phase of the DBW's decision-making process. The DBW uses this methodology for determining potential new sites to treat, methods to use, and monitoring procedures.

The DBW is permitted to conduct treatments for between April 1 and November 30 of each year. Should DBW obtain authorization to begin treatments at an earlier date, DBW will revise this APAP to include the new start date. Depending on growth conditions of *Egeria* (i.e. new growth), presence of listed fish species and water temperatures, spring treatments may start March 1st in some sites, or as late as May 15th. When *Egeria* begins to re-grow in spring, the plant sends long lateral stems from the parent stem and thus causes the most problems with boats and pumps. Treatments in spring will typically last for up to 12 weeks, but could go as long as 16 weeks. The treatment start time depends on the water temperature, extent of *Egeria* growth, and results from a review of fish survey data.

6. Aquatic Pesticides, Application Method, and Adjuvants

The DBW reviewed information on available registered aquatic herbicides to determine those that could be used for *Egeria* in the Delta. Ultimately, the DBW identified the following registered aquatic herbicides for the EDCP, each of which is labeled for the control of *Egeria*:

1. Four fluridone formulations –
   - ❑ Sonar* AS (liquid), EPA Registration Number 670690-4
   - ❑ Sonar® Precision Release (granular), EPA Registration Number 67690-12
   - ❑ Sonar®Q (pellet), EPA Registration Number 67690-3
   - ❑ Sonar® One (pellet), EPA Registration Number 67690-45
2. Penoxsulam (Galleon* SC), EPA Registration Number 67960-47
3. Imazamox (Clearcast®), EPA Registration Number 241-437-67690
4. Diquat (Reward®), EPA Registration Number 100-1091
5. Endothall (Aquathol® K), EPA Registration Number 70506-176

Sonar

Sonar is a systemic aquatic herbicide with fluridone as its active ingredient. Sonar pellet and granular formulations provide different release profiles due to the characteristics of the inert clay ingredients. Fluridone is a slow-acting systemic herbicide used to control primarily broad-leaved, submersed aquatic macrophyte species. Fluridone inhibits formation of carotenoid pigments (including carotene) through inhibition of the enzyme, phytoene desaturase. Carotenoids protect chlorophyll from photooxidation and therefore lack of carotenoids results in the degradation of chlorophyll when exposed to sunlight. Sonar can kill roots and shoots of aquatic plants, thus producing a longer lasting effect than contact herbicides, such as Reward. Sonar is most effective when the plant is growing rapidly and particularly effective in dead end sloughs with minimal tidal water exchange and insignificant water flows. White (chlorotic) or pink growing points appear on the target weed seven to ten days following initial treatment. Weed control is achieved after thirty to ninety days of treatment under optimal conditions. The Sonar liquid formulation is applied from a boat using an injection application, while Sonar granular formulations is applied from a boat using a hopper that broadcasts Sonar pellets to the waterway.

Photolysis is one of the major degradation pathways of fluridone, breaking down the herbicide into naturally occurring elements. Metabolites of fluridone include 1-methyl-2-(4-hydroxyphenol)-5-[3-trifluoromethyl)phenyl]-4[1H]-pyridone, benzaldehyde, 3-(trifluoromethyl)-benzaldehyde, benzoic acid, 3-(trifluoromethyl)-benzoic acid, and N-ethylformamide (McLaren/Hart, 1995).

Penoxsulam

Penoxsulam is a broad spectrum herbicide that inhibits the enzyme acetolactate synthase (ALS), which regulates the production of three essential amino acids: valine, leucine, and isoleucine (Washington DOE 2012). ALS inhibitors slowly starve plants of these amino acids, eventually killing the plants by halting DNA synthesis. Plants absorb penoxsulam through leaves, shoots

and roots. The herbicide affects new growth more rapidly than older plant tissue. Symptoms following treatment with penoxsulam include immediate growth inhibition, a chlorotic growing point with reddening, and slow plant death over a period of 60 to 120 days. Penoxsulam degrades into eleven major and two minor degradates (USEPA 2007). None of these metabolites or degradates have been identified as having a higher toxicity potential than penoxsulam (Washington DOE 2012). Penoxsulam is a new EDCP herbicide and will be applied from a boat by injection application (liquid form) below the water surface or by broadcast spreaders (granular form) attached to the boat.

Imazamox

Imazamox is a relatively fast-acting systemic herbicide. It is readily absorbed into the foliage and translocated throughout the plant by phloem and xylem tissues. The mode of action is through ALS inhibition, blocking the synthesis of three essential amino acids, leucine, isoleucine, and valine (Washington DOE 2012). Imazamox inhibits plant growth within the first 24 hours, with visual symptoms appearing about one week after treatment. Symptoms include yellowing leaves and general discoloration. The primary metabolite is demethylated parent chemical with intact ring structures and two carboxylic acid groups. A secondary metabolite is a demethylated, decarboxylated parent with intact rings and one carboxylic acid group (USEPA 2008). The EDCP will use available formulations of imazamox. Liquid imazamox will be applied below the water surface, using an injection application from a boat, and the granular formulation, will be applied with broadcast spreaders that are attached to the boat.

Diquat

Reward (diquat dibromide) is a post emergent, non-selective, broad-spectrum contact herbicide. Reward is water soluble and non-selective. Diquat bromide is the active ingredient in Reward. Diquat is fast acting and rapidly taken up by aquatic vegetation. Diquat is a photosynthetic electron flow diverter and controls weeds by causing rapid disruption of cellular membranes resulting in rapid kill with effects visible within a few days. Because the herbicide is so fast-acting, diquat is not translocated to other portions of the plant, acting only on the portions of that the herbicide contacted. Diquat dibromide rapidly disassociates to the diquat cation. Reward is applied from a boat using an injection application (i.e., injected directly to the waterway from the boat).

Endothall

The aquatic formulation, Aquathol K (dipotassium salt), received USEPA approval through the reduced risk program in 2009. Endothall is a fast-acting herbicide that is effective on most SAV. It has been classified as a contact herbicide, though recent research indicates that it is translocated throughout hydrilla and Eurasian watermilfoil more effectively than some systemic herbicides, such as fluridone, penoxsulam and triclopyr (UPA Aquatics undated; Ortiz et al. WAPMS conference presentation 2017). The herbicide therefore exhibits the fast-acting characteristic typically associated with contact herbicides, but it may function as a systemic herbicide in some plants. Endothall is not thought to be translocated to the same extent in all aquatic plants (Keckemet 1968; Madsen et al. 2010). Plants treated with Endothall may begin to die within days of contact. Senseman (2007) reports that symptoms include plant defoliation and brown desiccated tissue (Madsen et al. 2010).

Studies of Endothall vary in their conclusions about the chemical's degradation, metabolites, and persistence (SERA 2009). Some studies report rapid degradation consistent with first-order kinetics, while other studies have determined that degradation is initially very slow (for several weeks after application) before it begins to degrade rapidly (SERA 2009). Studies also report different persistence of Endothall in water (SERA 2009). There are limited data about metabolites of Endothall (SERA 2009), but it initially produces glutamic acid, which is degraded by microbes in 30 to 60 days (WI DNR 2012). Aquathol K is applied from a boat using an injection application (i.e., injected directly to the water way from the boat).

No adjuvants are used with any EDCP herbicide applications.

7. Application Area and Treatment Area in the System

Appendix 5 is DBW's general plan for EDCP application areas and treatment areas. The DBW expects that a given site's "treatment area" will be represented by a 100-foot buffer around the "application area." Based on unique conditions present at a site during treatment and the size and geometry of a site, this 100-foot buffer zone may be modified.

8. Alternative Control Methods Used and Their Limitations

Aside from the aquatic herbicides used by the DBW for the EDCP, the DBW identified potential alternative control methods for *Egeria.* If authorized by USFWS and NMFS, the EDCP will incorporate the following alternative methods into the EDCP operations.

Diver Assisted Handpicking

The EDCP will incorporate diver assisted handpicking and diver-operated suction harvesting in isolated instances. These methods which are methods, which are well-established in other states, will be new to EDCP operations.
Diver assisted handpicking involves the use of a small rake or hand-tool when needed to ensure the plant is completely removed. It will be necessary to utilize contracted SCUBA divers for this work because *Egeria* is rooted in the sediment, typically in an average of five to ten feet water depth. Divers will place the harvested plant in net bags, making sure to collect all fragments. Because *Egeria* reproduced vegetatively, plant fragments can be a source of new infestations if not removed from the water. Collected plants will be disposed of in approved locations away from water's edge and sensitive habitats.

Key issues related to handpicking include removal of the entire root crown and fragments (Greenfield et al. 2004), disposal of plants away from the shore, and the need for certified SCUBA divers. For EDCP, handpicking is likely to be most effective when used to remove small, localized infestations, and/or in conjunction with benthic barriers.

Diver-Operated Suction Harvesting

This method is essentially equivalent to vacuuming the plants, which are then removed to a basket on a boat, barge, or nearby dock. This method will be used in isolated instances. SCUBA divers hold a 3 to 5 inch-wide hose attached to a high pressure water pump. Plants are pulled through the hose into the collection basket and water any sediment is drained back into the water body. The plant mass is disposed of at an approved site away from shore. This method can be highly selective, as trained divers can literally pick and choose which plants to remove. Similar to handpicking, the complete root crown and all plant fragments will need to be collected in order to prevent reinfestation. This method can cause a temporary disruption in sediment. If sediment disruption significantly increases turbidity, EDCP could utilize silt curtains to localize the temporary increase in turbidity.

This method can be expensive, and is limited by underwater visibility and diver safety concerns. Another concern is that if sediments in an area that is harvested contain heavy metals or other toxic materials, suction harvesting can release these materials into the water (New York DEC 2005). The amount of plant biomass removed through suction harvesting can be substantial. However, the method is slow, with one diver able to harvest approximately 100 square meters per day (Madesen 2000). The EDCP will obtain all necessary additional permits prior to implementing this method.

Benthic Barriers

Recently, the EDCP identified the use of benthic barriers as a potential alternative control method. This method, which is well established, will be new to the EDCP operations. The EDCP will incorporate benthic barriers in isolated instances. The DBW cannot use bottom barriers for the extensive area of *Egeria* infestation in the Delta. The EDCP will utilize benthic barriers in selected locations where they are likely to be most effective, including relatively small areas and high intensity use areas such as docks, boat launch areas, and swimming areas.

Various materials applied to the bottom of a water body can act as a barrier to prevent weeds from growing. Benthic barriers consist of a physical cover over aquatic weeds, preventing sunlight from reaching plants. Black plastic is an example of a material used as a bottom barrier. Bottom barriers generally are useful in limited applications around docks.

Barrier tops require frequent maintenance to prevent sediment from accumulating on them. Bottom barriers used on river bottoms can accumulate gases underneath them, causing them to rise to the surface. Barriers dislodged or displaced from their control area can become a significant environmental problem. The EDCP will obtain all necessary additional permits prior to implementing this method.

9. EDCP Monitoring Program

Appendix 6 is the DBW's water monitoring plan for the EDCP. Adjuvants are not used for the EDCP, so monitoring for adjuvants is not included in the monitoring plan.

10. Gates or Control Structures and Inspection Schedule

This element is not applicable for the EDCP. The DBW does not maintain or use gates or control structures as part of the EDCP. Thus, the DBW does not have an inspection schedule of gates or control structures.

11. Section 5.3 Exception Status

This element is not applicable for the EDCP. The DBW does not have a Policy Section 5.3 exception. A Section 5.3 exception refers to a short-term or seasonal exception that dischargers may be granted, in accordance with Section 5.3 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*. The exception allows dischargers to exceed water quality criteria and receiving water limitations during treatment for priority pollutants, acroleine, and copper, as set by the California Toxics Rule.

12. Best Management Practices (BMPs)

The DBW has developed the following BMPs for the EDCP as a guide to train application crews and document best management practices (BMPs).

BMP #ED1 – Herbicide Handling Requirements

All personnel involved with the application of EDCP herbicides will be trained in herbicide handling in accordance with Food and Agriculture Code and Title 3 Code of Regulations pertaining to Pesticides and Pest Control Operations.

Storage

All EDCP herbicides will be stored in a secured warehouse in accordance with the California Food and Agriculture Code and Title 3 Code of Regulations. All herbicides obtained from the storage area will be recorded in the storage area logbook as well as in the individual treatment crew's daily log.

Transport

Herbicides will be delivered by truck or boat to specific treatment sites on the day of treatment. They will be transported in their original containers, securely fastened to the truck or boat, in a manner that will prevent spillage onto or off of the vehicle or vessel. Spill kits and MSDS sheets will be provided when traveling in any vehicle

Mixing, Loading and Applications

DBW staff shall use undiluted herbicides from containers of 5 gallons or less; only the herbicide containers being used will be opened at the application site. All mixing, loading, and application operations will be conducted in accordance with all label requirements and will be performed by licensed pesticide applicators.

Disposal of Herbicide Containers

Herbicide containers will be triple rinsed and disposed of according to herbicide label and applicable regulations.

BMP #ED2 – Spray Equipment Maintenance and Calibration

Calibration Approach for Sonar (Fluridone) Liquid Applications[1]

To apply Sonar (Fluridone) liquid, the DBW uses injection spray apparatus that pumps water from a 30-gallon tank.

At a location off of the target waterway the application crew performs the following calibration procedure to assure that the herbicide is applied to a given site at labeled rates:

[1] Since Reward (Diquat) bottles already come with concentrations of Reward (Diquat) at labeled rates, applications of Reward (Diquat) are made by adding a known quantity of Reward (Diquat) directly to boat spray tanks and making the application over a known area.

1) Fill the 30-gallon tank with water
2) Adjust the nozzle size on the spray apparatus to reflect the nozzle size appropriate for the expected field conditions
3) Run the 30-gallons of water through the spray apparatus at a constant rate and record the time that it takes for the water to completely run through the apparatus. This is the rate of application (i.e., 30-gallons per X minutes).
4) At the application site, determine the time that the application crew takes to travel a known distance (pass) at a known constant boat speed
5) At the application site, determine the quantity of mixture that is applied over this known distance (pass), at a known constant boat speed
6) Determine the number of passes that the application crew can make over a known distance
7) Adjust the boat speed, if necessary, to ensure mixture is completely applied over a set number of passes

For example, assume that:

a) The application area at a given site is 100 feet long and 30 feet wide
b) The rate of application is 30-gallons per 30 minutes (#3 above)
c) The application crew takes 10 minutes to travel the 100-foot-long site at 5 mph (#4 above), the equivalent of one "pass"
d) The application crew applies 10-gallons of mixture in one pass (#5 above)

Then:

The application crew can make 3 passes along the 100-foot application area to completely apply the herbicide (at 5 mph). In practice, each pass would be made to cover each 10-foot increment of the 30-foot site width.

Calibration Approach for Sonar (Fluridone) Pellet Applications

Sonar (Fluridone) pellets are applied using a broadcast spreader. Pellets are placed into a hopper on the boat. The hopper has a gate that can be adjusted to apply pellets at a faster rate or slower rate.

1) Before ever treating a site, based on the Pesticide Recommendations for Fluridone Pellet Applications and the site conditions, the PCA and Field Supervisor calculate the quantity of pellets, in pounds, that can be applied to a given site.
2) Based on the fact that the broadcast spreader can cover an approximately 30-foot width, the application crew determines the number of passes that it needs to make to cover the site.
4) The application crew places the permitted quantity of pellets in the application spreader.
5) The application crew covers a pass, or a known distance, at a known boat speed, at a constant pellet application rate, and determines the quantity of pellets, in pounds, that are applied.

6) The application crew either adjusts the gate opening, or adjusts the boat speed, to increase or decrease the rate that pellets are applied over a pass.
7) The application crew completes the remaining passes to cover the site.

BMP #ED3 – Spill Avoidance

All herbicide spills will be treated as emergencies. Concentrated herbicide spills are more dangerous than herbicides diluted with water, and will be treated seriously and immediately. While spills can occur during transporting, storing, or while using herbicides, the DBW will apply the following preventive measures to reduce the potential for a serious spill:

- ❒ For boats – herbicides will be securely fastened to floats in their original, watertight containers. Each boat shall carry a marker buoy with an attached anchor line to mark any herbicide, and water movement from the spill site, in the event of a spill.
- ❒ For vehicles – herbicides will be transported in their original, watertight containers, in a manner that will prevent spillage. MSDS and herbicide labels will be carried during transportation.

In addition, the spray operator will carry a GPS device to reference/record location in the event of a spill.

Reporting Spills in Water

The Applicator Specialist will have a cellular phone in his/her possession and the telephone numbers of the California Department of Parks and Recreation Hazmat Coordinator, California Department of Fish and Wildlife (Office of Spill Prevention and Response), California Regional Water Quality Control Board, State Office of Emergency Services, County Agricultural Commissioner's, County Sheriff's Office, the California Highway Patrol, County Health Departments, and DBW management and staff. Field staff are provided with Spill Emergency Contact Telephone Numbers, provides a list of emergency telephone numbers to use in case of a spill.

Herbicide spills will immediately be reported to the Department of Parks and Recreation Hazmat Coordinator, Aquatic Weed Unit Manager, and Field Supervisor. In the event of a spill in water the following procedures will be employed:

- ❒ The location of the spill will be marked
- ❒ The Aquatic Weed Unit Manager will be immediately notified
- ❒ The amount of herbicide spilled will be assessed

The Specialist will mark the spill location with a marker buoy and an approximate bearing with any permanent land markers. A GPS reading will be taken and photographs of the spill will be taken. If deemed necessary, DBW will monitor the area for herbicide residues and environmental impacts.

Reporting Spills on Land

If a spill occurs on a public roadway, the Specialist immediately notified the Department of Parks and Recreation Hazmat Coordinator, Environmental Program Manager, and Field Supervisor.

In the event a spill occurs, it is of paramount importance that the discharge is stopped at its source and that the spilled material be contained. DBW and contracted personnel will have access absorbent materials that will be used for immediate containment of the spilled material. The following actions will be taken as necessary to contain a spill on ground:

- ❒ Stopping the spill at its source
- ❒ Diking the spill as necessary
- ❒ Using spill absorbent material as appropriate

Contaminated absorbent material shall be placed in a sealable disposable container suitable for transporting. The container will be labeled with its contents, including herbicide name and signal word and disposed of in accordance with the label and all applicable laws and regulations.

The spill and its cleanup will be documented with photos (if possible) and the date/time registered. Copies of these photos will be attached to any spill reports filed.

BMP #ED4 –Environmental Awareness Training

All EDCP personnel will receive required annual environmental awareness training. This training will be provided by a USFWS approved biologist, typically one of the program environmental scientists. This training is designed to teach treatment crews how to identify special status species and implement the endangered species avoidance measures and other environmental and water quality measures required of the EDCP. The trainings will inform treatment crews and other EDCP staff about the presence of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and North American green sturgeon and their associated habitats, and that unlawful take of the animal or destruction of its habitat is a violation of the Endangered Species Act. The training will include instruction on the following species:

- ❒ Species identification and adverse effects avoidance/minimization guidelines for delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon
- ❒ Life history of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon.

- ❒ Protocol for identification and protection of delta smelt, giant garter snake, valley elderberry longhorn beetle, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, green sturgeon and associated protected habitats
- ❒ The importance of delta smelt migratory routes, the importance of irrigation canals, marshes/wetlands, and seasonally flooded areas to giant garter snake, the importance of elderberry shrubs as habitat for valley elderberry longhorn beetle
- ❒ Procedures for review of maps marking giant garter snake habitat and valley elderberry shrubs as part of EDCP treatment activities
- ❒ All terms and conditions of the USFWS Biological Opinion for the EDCP and NMFS letter of concurrence for the EDCP for protection, avoidance and minimization of adverse effects to protect species under the Act.

The environmental awareness training will consist of 2-3 hours of training. The agenda for the environmental training is as follows:

1. Endangered Species Act
2. Threatened and Endangered Species
3. Avoidance and Minimization Measures
4. Environmental Considerations
5. What to do if There is Incidental Take

The treatment crews will receive additional training each year based on the most recent version of this document. The agenda for this additional environmental training is as follows:

1. EDCP Objectives
2. What Guides EDCP Environmental Compliance
3. Role of Aquatic Pest Control Specialists and Technicians
4. Herbicide Application Practices
5. Timing and Location of Treatments
6. Avoidance Measures for Endangered Species
7. Training Requirements
8. Monitoring Requirements
9. Planning, Studies and Reporting
10. Other EDCP Environmental Compliance Requirements
11. Questions and Suggestions

BMP #ED5 – Endangered Species Avoidance Measures

The EDCP implements avoidance measures to reduce or eliminate potential impacts of the program on endangered species. These measures are specified in the USFWS biological opinion for the EDCP and the NMFS Letter of concurrence for the EDCP, and fall into three areas:

1) timing and location of treatments, 2) avoidance measures for endangered species, and 3) mechanical treatment requirements.

A. Timing and Location of Treatments

1. Avoid herbicide applications near special status species and their associated habitat, including sensitive riparian and wetland habitat and other biologically important resources.
2. Conduct treatments according to the four areas defined in the USFWS Biological Opinion (**Appendices 2 and 3**).
    a. Areas 1, 2, 3 and 4 treatments may begin March 1st, subject to the field and fish survey processes described in item #4.
    b. Areas 1 and 2 treatments may utilize fluridone and diquat (with diquat approval)
    c. Areas 3 and 4 treatments may utilize fluridone, diquat (with approval), penoxsulam, and imazamox.
3. Conduct diquat treatments between August 1st and November 30th
    a. Diquat will be used for emergency conditions only
    b. DBW will not treat a total of more than 5- acres using diquat per year.
4. Conduct treatments between March 1st and July 1st after consulting fish surveys to determine whether listed fish species are likely to be present, following the procedures below:

    1. For Areas 1, 2,3 and 4:

        a. Begin conducting regular field surveys in late-February to identify re-growing *Egeria densa* (see as re-greening of winter stunted plants. Hydroacoustic mapping is also used to assess levels of *Egeria* infestation for each site in the Delta. Sites with high *Egeria* density and biomass will be identified as potential treatment sites.
        b. Each week, the Environmental Scientist will check the several State and federal fish survey data to determine whether listed fish species are likely to be near or in any of the potential treatment sites.
        c. Between March 1st and July 1st, the Environmental Scientist will prepare a weekly summary list for USFWS and NMFS that identified treatment sites where listed fish species are not likely to be present.
5. Report proposed treatment sites to USFWS and NMFS prior to the treatment week through the NOI and fish survey reporting processes.

B. Avoidance Measures for Endangered Species

General Avoidance

1. Provide treatment crews with electronic mapping that identified previously surveyed and sensitive areas for giant garter snake habitat and locations of valley elderberry shrubs.
2. Consult with the Environmental Scientist about upcoming applications to determine whether presence of an Endangered Species in a planned treatment area will prevent a scheduled application.
3. Prior to treating a site, perform a visual survey to determine whether special status plants, animals, or sensitive habitats are present. Complete the Environmental Observations

Check list. If any sensitive species are present at the site, the application crew should not perform the treatment.

4. Avoid herbicide application near special status species, and sensitive riparian and wetland habitat; and other biologically important resources.
5. Conduct herbicide treatments in order to minimize potential for drift.
6. Operate program vessels in a manger that causes the least amount of disturbance to the habitat.

Listed Fish Species

7. Follow herbicide label and USFWS BO requirements for diquat treatments to minimize the potential for effects on the listed fish species resulting from low DO levels following herbicide application:
   a. No more than one-half of a water body should be treated with diquat at one time, with a waiting period of 14 days for follow-up treatments of the remaining area. Follow diquat label requirements to reduce the potential for DO impacts.
   b. Take dissolved oxygen readings prior to treatments and do no initiate treatments if measured DO levels are between 3.0 gm/L and 5.0 mg/L.

Giant Garter Snake

8. Avoid disturbance of upland giant garter snake habitat (through disposal of harvested water hyacinth or land-based treatments) between May 1 and October 1.
9. Do not harvest or dispose of *Egeria densa* in sensitive riparian and wetland habitat typically associated with giant garter snake.

Valley Elderberry Longhorn Beetle

10. Conduct all herbicide applications downwind of elderberry shrubs.
11. Maintain a 100-foot buffer between treatment sites and shoreline elderberry shrubs for most treatment sites.
12. Do not dispose of *Egeria densa* in sensitive riparian and wetland habitat typically associated with valley elderberry longhorn beetle. Identify and utilize disposal areas [for harvested *Egeria*] that are at least 100 feet away from elderberry shrubs.

BMP #ED6 – Dissolved Oxygen Measurements

Each day applications are made, the application crew will take a reading of the ambient dissolved oxygen (DO) in the water body near the application location at the midpoint of the water column, or at a depth of 5 feet, whichever is closer to the surface. This reading will be taken both within one hour prior to the application and within one hour of completion of application. The date, time, water body name, and exact location will be recorded. The location description shall include the UTM determined using a GPS device.

In accordance with NPDES permit conditions; within the legal boundaries of the Delta, the discharger shall not cause the following:

- ❑ The DO shall not be reduced below 7.0 mg/l in the Sacramento River (below the "I" Street Bridge) and in all Delta waters west of the Antioch Bridge.
- ❑ The DO shall not be reduced below 6.0 mg/l in the San Joaquin River (between Turner Cut and Stockton, September 1 through November 30).
- ❑ The DO shall not be reduced below 5.0 mg/l in all other Delta waters*.

*Note:

- Applications may occur in a site if DO reading is below 3.0 mg/l, since DO is considered by USFWS & NMFS as too low for fish use.
- **No** applications may occur if the DO is between 3.0 mg/l and 5.0 mg/l.
- This rule does not apply to the second application in a sequential site. (i.e., a Reward (diquat) application is completed and the DO reading is being taken in preparation for the start of Sonar (fluridone) applications.) In a sequential application, where the second application is fluridone, DO readings must be 5.0 mg/l or greater.

When natural conditions lower DO below these levels, the concentrations shall be maintained at or above 95 percent saturation. For surface water bodies outside the legal boundaries of the Delta, the discharger shall not cause the following:

- ❑ The monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation.
- ❑ The DO concentrations shall not be reduced below the following minimum levels at any time:

- Waters designated WARM, 5.0 mg/l
- Waters designated COLD, 7.0 mg/l
- Waters designated SPWN, 7.0 mg/l.

Note: when natural conditions lower DO below these levels the concentrations shall be maintained at or above 95 percent saturation.

If the application crew is unsure the DO equipment is operating properly, the application crew should contact the Field Supervisor, his designee or the ES, to calibrate the equipment. Application crews should assure that:

- ❑ Equipment not operating properly is not used
- ❑ Equipment not operating properly is repaired as soon as possible
- ❑ The office is notified well ahead of time when new membranes and other calibration equipment are needed.

BMP #ED7 – Agricultural and Water Intake Coordination

The NPDES permit requires notification to potentially affected public agencies at least 15 days prior to the first chemical application. The notification includes the following information:

1. A statement of DBW's intent to apply aquatic herbicides
2. Names of the aquatic herbicides
3. Purpose of use
4. General time period and locations of expected use
5. Any water use restrictions or precautions during treatment
6. A phone number that interested persons may call to obtain additional information from DBW.

In addition to the public notification described above, the EDCP implements specific measures to ensure that herbicide treatments do not negatively impact agricultural intakes and potable water intakes. The EDCP follow all herbicide label requirements as they relate to use of treated water for irrigation or drinking purposes.

Should DBW need to coordinate with a county water district, SWP or CVP regarding water quality impacts, DBW will contact the agency to discuss a protocol for notification of treatment. Generally, DBW will notify an agency in advance of the proposed treatment.

For agricultural irrigation water intakes, the EDCP identify and maps agricultural water intakes in each treatment site. The EDCP conduct surveys of crops adjacent to treatment sites, and identify any potential incompatibilities with treatment herbicides to avoid adverse impacts to potentially sensitive crops.

BMP #ED8 – FasTest for Fluridone Applications

FasTests are intended as a tool to ensure the efficacy of Sonar (fluridone) applications. It is important that results are reported to the field as soon as possible, so that appropriate application adaptations can be made. Procedures for completing a FasTest are provided below:

A. Water Sample Collecting Procedure:

1) Pre-label bottles in a dry, clean environment
2) Keep bottle lids on and in Ziploc baggie prior to use to prevent contamination
3) Use map to orient approximate location of sampling station
4) Record GPS easting/northing for chain of custody
5) Set up and run sampler at sampler station.
    a. Sampler should be approximately 12 inches from water-body floor.
        i. If circumstances prevent this (i.e., exceptionally high tide), note on chain of custody depth from bottom sample was collected and why it was not collected 12 inches from bottom.
    b. Sampler should run for approximately 30 seconds before sample is collected at each station.
6) Before collecting sample, rinse bottle once or twice with water out of end of sampler.
    a. Avoid contaminating inside of bottle with fluridone dust or residue.

B. Fill out the Chain of Custody that includes the following information:

- ❑ Company Name
- ❑ Mailing Address
- ❑ Contact Person
- ❑ Billing Address
- ❑ Telephone
- ❑ Email address
- ❑ Sampler
- ❑ Client Sample ID (Site # - Station #)
- ❑ Date(s) treated
- ❑ Date last treated (Not date of sample collection)
- ❑ Sonar formulation applied
- ❑ Date Sample Collected
- ❑ Application Rate
- ❑ Treated Areas
- ❑ Sample Location (GPS Easting and Northing)
- ❑ Field Notes (i.e. any deviations from protocol)
- ❑ Water-body Name
- ❑ Water-body Size
- ❑ Depth Average
- ❑ Depth Collected
- ❑ Target Plants

C. Reminders:

1) Collect all samples with samplers that have been provided. Change sampler tubing after each treatment site is sampled.

2) Label bottles before collecting sample (recommend doing this dockside)
   a) Labels should include:
      - ❑ Site name
      - ❑ Site #
      - ❑ Date Sample collected
      - ❑ Sample station number. A map will show sample station numbers. Include a copy of the map with the Chain of Custody. Station numbers on map should match sample numbers on bottles and chain of custody.

3) Collect samples <u>before</u> making application. Please use gloves and be careful not to contaminate sample bottles.

4) Make sure supervisor or ES knows when there are FasTests to be transported to Sacramento.
   a) Keep FasTests in a Ziploc baggie.
      i) Keep samples on ice in a cooler
      ii) Headquarters office will process all FasTests.
      iii) Make sure they know they will be arriving.

13. Evaluation of Possible Alternatives

The DBW addressed a "No Project" alternative to the current EDCP and also considered other control methods. In this section, the "No Project" alternative is compared with the project objectives. Additionally, environmental impacts associated with this alternative and other alternative control methods are discussed.

Under the "No Project" alternative, no action would be taken to control *Egeria* in the Delta. No attempt would be made to stop the further spread and growth of *Egeria* to non-infested Delta waterways. To take no action would be contrary to the Legislative mandate. Assembly Bill 2193 authorizes the DBW to undertake an aggressive program for the effective control of *Egeria*.

Potential Environmental Impacts of "No Project" Alternative

The "No Project" alternative could result in short-term unavoidable significant impacts to hydrology and water quality. The "No Project" alternative would not meet the key project objectives for limiting growth and spread of *Egeria* and improving vessel navigation in the Delta.

Under the "No Project" alternative *Egeria* could continue to grow and spread beyond current areas and become more dense in currently infested areas. It is difficult to estimate the rate of growth because *Egeria* growth has not been measured historically in the Delta and its growth is dependent upon the interaction of many complex factors. *Egeria* likely was introduced nearly 40 years ago and has grown to cover approximately 3,900 water body surface acres in the Delta, an approximate rate of growth of 100 acres per year. Conservative estimates predict that the quantity of surface acres infested with *Egeria* could increase at this linear rate of 100 acres per year.

It is possible that *Egeria* could continue to grow at an exponential rate under ideal growing conditions. Should this be the case, and should nothing be done to control its growth now, California would face a bigger problem in the future should it be forced to control a much greater amount of *Egeria* infestation using a greater quantity of aquatic herbicides. If this were the case, current use of the EDCP is a way to potentially minimize and avoid such an outcome.

Without a coordinated effort by the DBW to treat *Egeria* to minimize environmental impacts, with the best available control methods, the potential exists for private citizens to utilize their own *Egeria* control methods. These ad hoc treatments result in: 1) potentially inappropriate selection of control methods that may not be efficacious; 2) improper application rates for aquatic herbicides; and 3) associated significant adverse impacts to fish, wildlife, and water quality. Further, these ad hoc treatments actually may result in a larger cumulative loading of aquatic herbicides than from a more systematic, coordinated, and focused control effort. *Egeria* could be more difficult to control in the future if allowed to spread and grow, resulting in the potential for increased herbicide usage in the future.

Impacts of the "No Project" alternative are organized into general resource categories. Where a category is not listed there would be no impact to that category from the "No Project" alternative.

Hydrology and Water Quality

The following temporary unavoidable significant impacts could occur under the "No Project" alternative, including:

- Dense mats of *Egeria* could continue to block sunlight and reduce the amount of open water, leading to increased accretion of organic material and increased sedimentation
- *Egeria* could continue to capture and settle out heavy metals and other particulate matter into Delta sediments.

These impacts are balanced with the possibility that leaving *Egeria* beds could decrease turbidity levels in selected Delta waters. *Egeria* beds slow water flow, which causes sediments to drop out of the water column.

Biological Resources

The "No Project" alternative would have temporary unavoidable significant impacts to various biological resources. This conclusion is based on the impacts summarized below:

Plants

- *Egeria* could continue to thrive and compete as a nonnative species without any natural predators.
- Native vegetation (such as pondweeds) has declined due to the presence of *Egeria*. *Egeria* could continue to displace native vegetation, threatening the long-term viability of these species in the Delta. By displacing pondweeds, *Egeria* also may reduce the habitat value for waterfowl that eat pondweeds.
- Under ideal conditions (e.g., low salinity levels and drought conditions), *Egeria* could potentially spread to infest and impact sensitive plant species in the Suisun Marsh.

Invertebrates - Aquatic

- Increased sedimentation resulting from the presence of *Egeria* could alter the population of benthic species and their predators.

Fish

- Some native fish species could be negatively impacted because *Egeria* lowers habitat values by decreasing ambient dissolved oxygen levels, and displacing native vegetation (which may provide a better habitat).
- Dense beds of *Egeria* could impede fish migration.
- Under ideal conditions (e.g., low salinity levels and drought conditions), *Egeria* could spread to infest and impact sensitive.
- Under the "No Project" alternative *Egeria* could potentially increase spawning grounds and habitat for non-native fish species.

Wildlife

- *Egeria* could impede migratory birds from landing, foraging, and occupying heavily infested areas (e.g., Frank's Tract).
- Under ideal conditions (e.g., low salinity levels and drought conditions), *Egeria* could spread to infest and impact sensitive wildlife species in the Suisun Marsh.

Agricultural Resources

The "No Project" alternative would have temporary unavoidable significant impacts. Agricultural intakes could continue to be clogged by floating *Egeria*.

Utilities and Service Systems

The "No Project" alternative would have temporary unavoidable significant impacts to utilities and service systems for the following reasons:

- The approximately 1,800 irrigation intakes throughout the Delta could continue to be repeatedly clogged by *Egeria*, resulting in inefficient pumping operations, increased pumping costs, and possible mechanical failure of pumps.

Additionally, *Egeria* growth could protect some levees, berms, and channel islands from erosion by providing a matt of material to absorb water flow.

Land Use Planning

Though the "No Project" alternative would have a less than significant impact to land use and planning, Delta businesses (including Marina operators, restaurants, others) could continue to incur economic losses if boaters refuse to moor their vessels in infested marinas or if boaters no longer can fish, water ski, or swim in the area due to *Egeria* infestation.

Recreation

The "No Project" alternative would have an avoidable significant impact to recreation for the following reasons:

- Boaters could continue to have difficulty keeping their engines running through certain infested areas, resulting in frequent restarting of failing engines and a corresponding increase in water and air pollution
- Boaters could be unable to access certain recreational location
- Boaters could be unable to launch vessels from some of the launching locations currently available
- Extensive fishing for the numerous game fish in the Delta could likely decline.

Transportation and Traffic

The "No Project" alternative would have an avoidable significant impact to transportation and traffic for the following reasons:

- *Egeria* could restrict access by emergency response units and policing vessels to selected areas of the Delta
- Boaters could continue to be unable to travel through critical water bodies within the Delta and could select alternative longer routes

- Boaters who opt to travel through water bodies infested with *Egeria* could continue to cause extensive *Egeria* fragmentation, further restricting these areas to future travel and spreading *Egeria* to other locations in the Delta.

Mitigation Measures for the "No Project" Alternative

There are generally no mitigation measures for this alternative. Delta marinas and businesses could continue to treat areas using their own methods to mitigate some impacts. However, these efforts likely would not stop *Egeria* from growing and spreading. Delta boaters could utilize non-infested areas for travel. Those recreating and fishing in the Delta could chose to recreate and fish at areas not infested with *Egeria*. Without using any control methods, there is nothing that the DBW could do to mitigate the impacts noted above.

Other Alternative Control Measures

This section describes control methods the DBW considered for the EDCP but determined were infeasible based on various operational, environmental, economic, and legal factors. A brief description of each method, and the reasons why each method was considered infeasible, are provided.

According to CEQA, feasibility is defined as capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors. Methods discussed in this subsection are organized into the following five areas:

- Hand Removal Methods
- Cultural Control Methods
- Biological Control Methods
- Mechanical Control Methods
- Chemical Control Methods.

Hand Removal (Not Diver Assisted)

Hand removal is occasionally used as a weed control method for relatively small areas. Individuals performing hand removal can focus control on the target weed and, in some cases, completely remove the weed at its roots. Hand removal requires physical collection, transport, and disposal of the weed at a disposal facility. This method may result in some degree of disruption to the environmental as a result of individuals walking near the target control area. Uncollected weed fragments may establish themselves at other locations outside the control area.

Reason Infeasible:

Hand removal would require significant manpower and resources to have any material impact on the level of *Egeria* infestation in the Delta. It is highly unlikely that individuals conducting hand removal could access many areas in the Delta infested with *Egeria*.

Cultural Control

Cultural control methods refer to modification of physical factors in the environment to discourage weed growth. This section identifies why other cultural control methods such as flow rate manipulation, water level manipulation, reduced light penetration, and nutrient limitation are infeasible for *Egeria* control in the Delta.

Flow Rate Manipulation

Flow rate manipulation refers to increasing or decreasing water flow through a channel for weed control. Typically, water velocity is increased to create enough force to break off and flush weeds downstream.

Reason Infeasible:

Flow rates could not be artificially increased in the Delta to levels required for weed control. Flow rate manipulation could seriously damage surrounding levees, canal structures, and other aquatic organisms that inhabit the Delta.

Water Level Manipulation

Water level manipulation refers to raising water levels to drown weeds, or lowering water levels to expose weeds to extreme conditions (e.g., drying out).

Reason Infeasible:

Water level manipulation is generally limited to lakes and reservoirs with adequate water control structures. Delta channels do not have such structures available to control water levels. Manipulation of Delta water levels to create deep or shallow waterways is therefore impossible.

Reduced Light Penetration

Reducing light penetration to submerged weeds can suppress their growth by inhibiting photosynthesis. Specially produced dyes applied to waterways can block light from penetrating the water surface and reaching the weed.

Reason Infeasible:

Dyes are only effective in ponds and areas with limited water flow. With the Delta's high water flow and significant tidal exchange, dyes would be ineffective at most sites.

Nutrient Limitation

Plants require a supply of essential nutrients to grow, including nitrogen, phosphorus, carbon, and others. Limiting at least one of these nutrients can interrupt plant growth. Nutrient limitation is generally possible in closed systems such as a lake or pond.

Reason Infeasible:

In the large, open Delta system the DBW could not limit nutrients from contacting *Egeria*. Delta waters periodically receive nutrients from numerous sources (e.g., agricultural runoff).

Biological Control Methods

Biological controls refer to the use of biological agents (called bio-control agents) to combat unwanted exotic species. Often these bio-control agents also are exotic. To find a bio-control

agent, a researcher travels to the country of origin of the unwanted species. Bio-control agents are tested in quarantine for "host-specificity" and successful candidates then can be released into their new environments.

When effective, biological control methods can offer permanent and self-perpetuating control while minimizing the risk to human health and the environment. Once a bio-control agent is established, additional releases may be unnecessary and additional costs may be avoided. Bio-control agents are sometimes, but not always successful.

Insects

A foreign insect species must be extensively tested and proven to be host specific before it can be released into the United States. Tests are designed to demonstrate that the insect will not feed appreciably on any other species. This ensures an insect will not harm crop plants or other desirable species.

Reason Infeasible:

There is no known insect currently available for *Egeria* control. Research is currently ongoing to find potential insects that control *Egeria*.

Pathogens

Suspensions of fungal spores can be applied to weed populations. Insects, especially stem borers and piercing-sucking types, often provide entry points for native plant pathogens. While neither the insect, nor pathogen, can substantially impact the weed population, together they can help control nuisance situations. Restrictions exist for importing pathogens from abroad. Thus, pathogens are limited to native species.

Reason Infeasible:

No known pathogen currently exists for *Egeria* control. Research is currently ongoing to find potential pathogens that control *Egeria*.

Triploid Grass Carp

The grass carp (*Ctenopharyngodon idella*) is a common bio-control agent used in closed water systems for controlling aquatic weeds similar to *Egeria* (e.g., *hydrilla*). The grass carp success is the primary reason it is controversial. If stocked in high enough quantities in a system, the grass carp can remove virtually all aquatic vegetation.

Triploid grass carp are the only non-indigenous fish that can be legally used for aquatic weed control in most states. Because of the fear that grass carp could escape into other U.S. waters, sterile ("triploid") grass carp are required by these states. Triploid grass carp are specially produced in hatcheries and possess three sets of chromosomes instead of the normal two sets. This abnormal condition causes sterility. Because they cannot reproduce, their number will not increase beyond the initial stocking. However, grass carp cannot be removed from large water bodies and are difficult to contain.

Reason Infeasible:

Pursuant to statutory exemption, the California Department of Fish and Wildlife (DFW) regulates introduction of non-indigenous fish species into California waters. The DFW has allowed grass carp in a few closed systems in California, closely monitoring their use. The DFW

is opposed to introducing grass carp in the Delta, due to the potential impacts to certain economies and sensitive fisheries.

Mechanical Control Methods

Mechanical control methods remove plants from the water either by cutting or dislodging them from bottom sediments with a cutting bar, chain, or drag line; cutting them above their attachment points in the hydrosoil (mechanical harvesting); or removing them from bottom sediments with a dredger (dredging). The DBW examined these mechanical control methods and found that mechanical harvesting and diver-operated suction harvesting are the only potential mechanical controls method possible for *Egeria* control in the Delta that meets the objectives of the EDCP. The remainder of this section describes why cutting without removal and dredging is infeasible.

Cutting Without Removal

A cutting bar, chain, or drag line suspended behind a boat is a relatively simple and inexpensive weed control method. The boat and cutting mechanism is easily assembled and maneuvered. A cutting bar, chain, or drag line assembly can quickly clear a passage through aquatic weeds. Hydraulic cutting shears mounted on the front end of a flat-bottomed boat also can achieve an effect very similar to the cutting bar, chain, or drag line. This shearing technique is particularly useful for areas around a dock.

No formal studies to explore the fate of *Egeria* fragments have been conducted for these cutting without removal techniques in the Delta. However, a U.S.D.A. study concluded that *Egeria* fragments were 99 percent viable.

Reason Infeasible:

These cutting without removal techniques would significantly spread *Egeria* fragments throughout the Delta. Fragments can float in the water indefinitely and have the potential to form large masses depending on tidal influences and water flows. During heavy water flow, floating *Egeria* could drift downstream and out of the Delta system. *Egeria* fragments also could move to a non-infested area and regenerate.

Mechanical Harvesting

The DBW determined that mechanical harvesting has limited applicability for the EDCP. However, due to operational constraints and the potential for *Egeria* fragmentation the DBW has proposed to use mechanical harvesting primarily for emergency use to gain immediate control of an area.

Mechanical harvesting consists of physically cutting and removing the aboveground portion of the plant and transferring the severed plant material to an off-site disposal location. Mechanical systems employ articulating cutter bars that can vary the cutting depth from the surface to approximately 10 feet.

Mechanical harvesters come in different sizes with various weed cutting and removal capabilities. Large harvesters have limited maneuverability in tight quarters, but with transport shuttles and shore-conveyer equipment they can remove large volumes of plant material from open areas relatively quickly.

Mechanical harvesting can clear several surface acres per day, depending on plant density, tides, currents, water depths, and off-loading access. Harvesters have limited use restrictions on a water body.

DBW preliminary research trials included a series of three mechanical harvesting efforts with an Aquatics Unlimited Aqua Moog harvester. By the third harvest of the season, remaining *Egeria* material averaged only one-tenth of the original biomass. However, research showed that fragments created by the harvesting process were viable, and could potentially establish themselves elsewhere. Also, mechanical harvesting creates significant amounts of unwanted plant biomass and fragmented material that must be disposed of in a satisfactory manner. Following harvesting, plant material will regrow.

Finding disposal sites for *Egeria* is difficult due to its water content. *Egeria* contains approximately 93 percent water. This moisture content is considered too excessive for a class III landfill. The DBW had samples of *Egeria* analyzed for the presence of 17 different metals, sulfide, and total cyanide. Samples were analyzed by a state-certified laboratory using U.S. Environmental Protection Agency (USEPA) analytical methods for the following (USEPA methods are noted in parentheses): antimony, barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, zinc (6010); arsenic (7060); mercury (7471); selenium (7740); thallium (7841); cyanide (9010); and sulfide (9030). Results of these analyses were sent to the Department of Toxic Substances Control for review. Concentrations reported all were well below the Total Threshold Limit Concentration hazardous waste criteria. In addition, the results were so low that extraction with the Waste Extraction Test was not necessary. These findings indicate *Egeria* does not accumulate harmful or toxic constituents, and thus would not contaminate disposals sites.

Even though the DBW would assure mechanical harvesting operations would be performed with minimal impacts, harvesting poses a number of potential operational and environmental problems, including the following:

- Harvested *Egeria* will produce fragments of plant material that, if not collected and disposed of properly, would greatly contribute to the spread of *Egeria*. Therefore, DBW crews or harvesting contractors would attempt to collect floating *Egeria* by sweeping the water surface with nets and collecting viable plant fragments. *Egeria* fragments then would be transported to shore and disposed of. However, many fragments would not be collected.
- In larger bodies of water, harvesting logistics may be overwhelming. It would be difficult to capture the large amount of harvested *Egeria* and haul it to an appropriate disposal facility.
- In deep waters the harvester may not reach all of the *Egeria*.
- Using mechanical harvesting while *Egeria* is still actively growing could enhance its growth rate. In many cases, *Egeria* also will grow back to levels present prior to harvesting.
- Mechanical harvesting indiscriminately damages fish and other organisms in present within *Egeria* stands.

Dredging

Dredging projects require federal permits from the U.S. Army Corps of Engineers, and potentially the U.S. Fish & Wildlife Service, California Department of Fish and Game, the

Regional Water Quality Control Board, and other local agencies. Approvals require time to obtain and monitoring activities have significant associated costs. Further, following dredging, other maintenance control methods are necessary to prevent regrowth. Dredging is expensive, especially if a nearby disposal site is unavailable.

Reason Infeasible:

Dredging is infeasible due to its significant potential environmental impacts (e.g., disruption of the native ecosystem, removal of entire populations of plants, aquatic invertebrates, and benthic organisms). Additionally, the elaborate permitting process routinely required, relatively high operation costs and short-lived benefits, also make dredging infeasible for *Egeria* control in the Delta.

Other Chemical Control Methods

Chemical control methods (i.e., aquatic herbicides) are the most common and versatile management strategy for controlling nuisance aquatic plant populations. Chemical herbicides provide longer lasting control than mechanical methods, involve minimal labor and equipment, provide flexibility and predictability, and ultimately cost less. Aquatic herbicides can be applied to areas unreachable by other methods.

Hundreds of herbicides are registered for use in the United States. Only a limited number of these herbicides effectively control aquatic weeds and also meet the rigid toxicology criteria necessary for registration. Currently, herbicides containing the following eight active ingredients are labeled for use for aquatic sites:

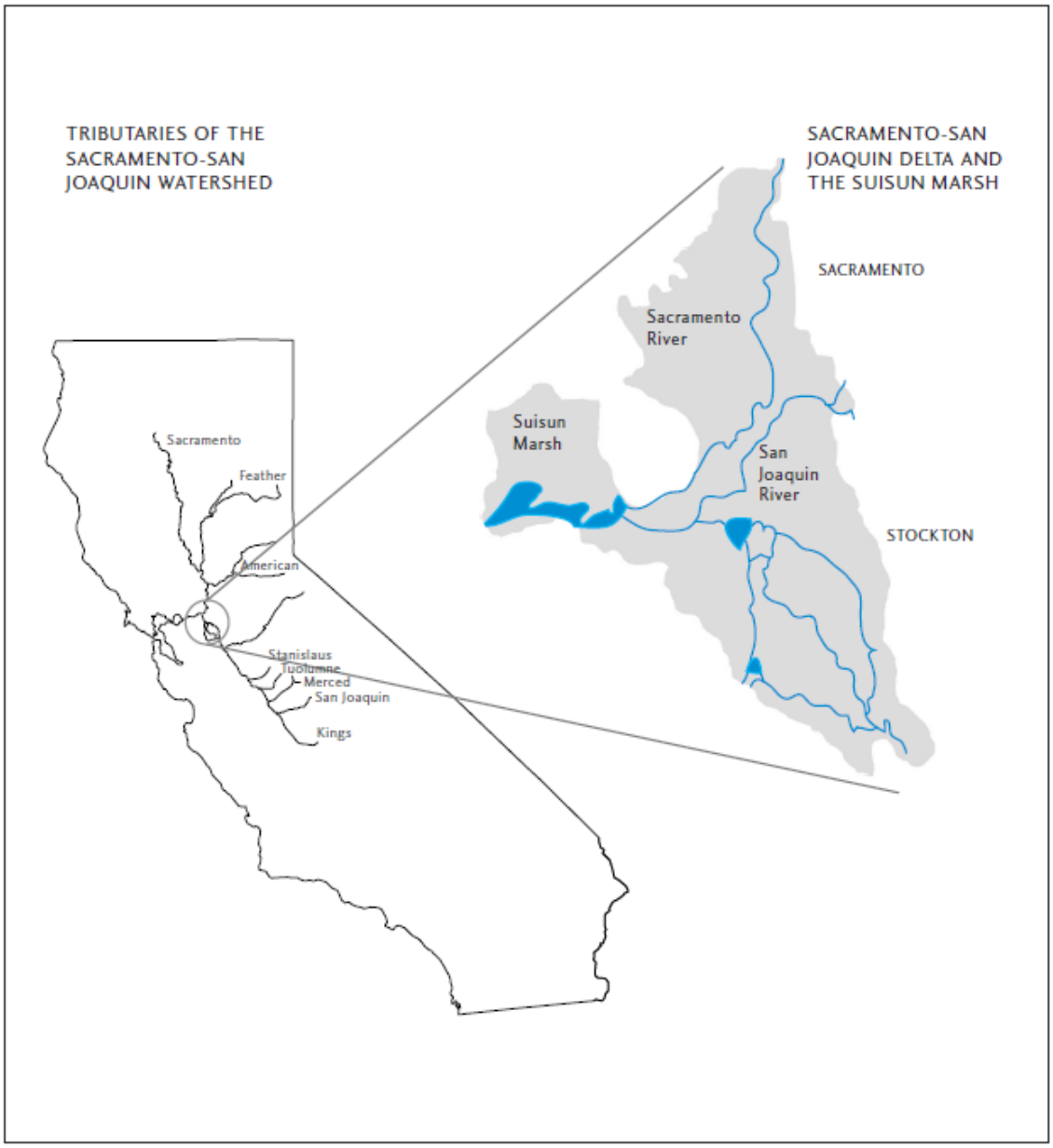
- ❑ Acrolein
- ❑ Endothall
- ❑ Copper
- ❑ Fluridone
- ❑ Dichlobenil
- ❑ Glyphosate
- ❑ Diquat
- ❑ Penoxsulam
- ❑ Imazamox
- ❑ 2,4-D.

Reason Infeasible:

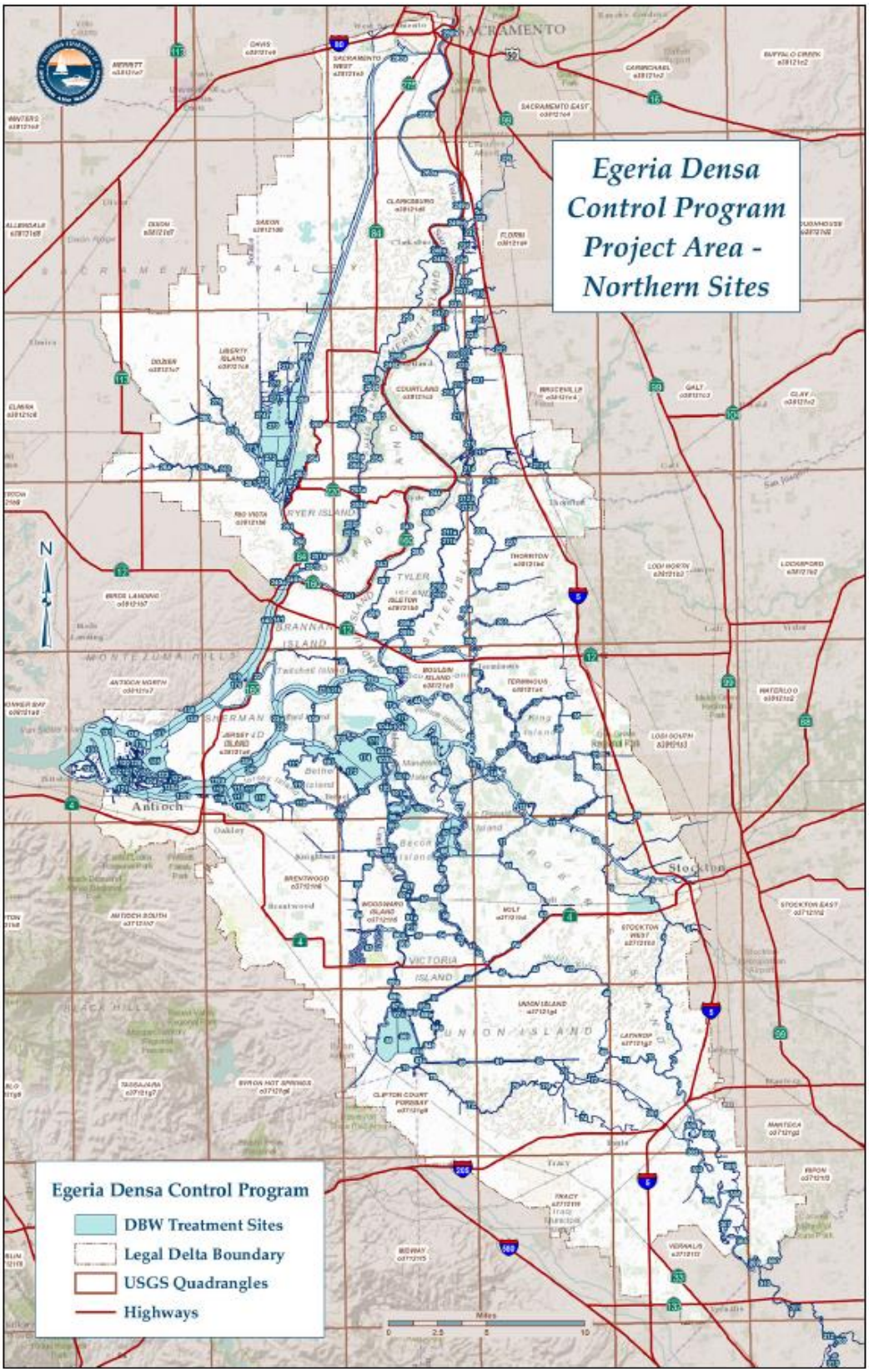
Herbicides with acrolein and copper are highly toxic. Herbicides containing dichlobenil and glyphosate are not intended for submerged aquatic vegetation. Endothall and 2,4-D are not effective for *Egeria* control in the Delta. Only herbicides containing fluridone, and diquat are both labeled for and considered effective for *Egeria* control in California. The EDCP plans to test penoxsulam and imazamox for *Egeria* control and will incorporate the use of these herbicides if trials prove effective in controlling *Egeria*.

APPENDICES

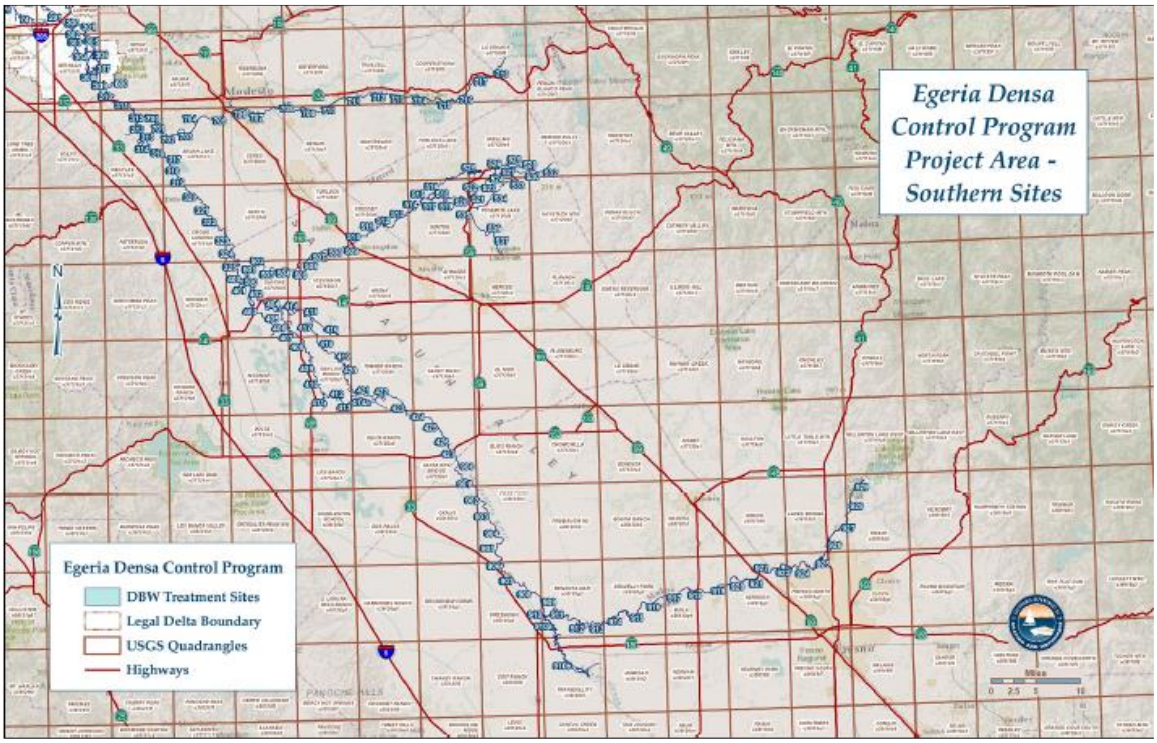
Appendix 1 – Area Map of Sacramento-San Joaquin Delta and Suisun Marsh



Appendix 2 – EDCP Northern Sites



Appendix 3 – EDCP Southern Sites



Appendix 4 – EDCP Pre-Treatment, Treatment, and Post-Treatment Phases (Appendix O from 2001 EDCP EIR)

Egeria densa Control Program Pre-Treatment, Treatment, and Post-Treatment Phases

	Pre-Treatment	Treatment	Post-Treatment
Process	***Project Area Survey and Primary Site Evaluation*** ❑ Measure the degree of the navigational impairment using aerial and field surveys; estimate *Egeria* biomass ❑ Evaluate the significance of the navigational impairment by analyzing survey data and other available information (e.g., provided by stakeholders) ❑ Consider if the site is suited for available treatment method ***Secondary Site Evaluation*** ❑ For each potential treatment site selected, evaluate the following indicators: *Biological* Presence of sensitive species *Chemical* Chemical levels in sediment, Chemical levels in water column, Dissolved oxygen, Water hardness, Water pH *Human-Related* Proximity to agricultural irrigation, *Egeria* disposal capability, Presence of human-made structures, Proximity to municipal water supply, Recreation activity, Site access *Physical* Water flows, Water temperature, Water turbidity	❑ Evaluate physical indicators at the site including: • Day length • Precipitation • Recreation activity • Sunlight • Tidal water exchange • Volume of vessel traffic • Water depth • Water flows • Water turbidity • Wind	❑ Monitor environmental impacts and efficacy of treatment using the following indicators: • Egeria biomass • Chemical levels in sediment • Chemical levels in water column • Dissolved oxygen • Egeria fragment levels • Impacts to sensitive fish species • Impacts to plant species • Impacts to wildlife species
Outcome(s)	❑ **Rank** potential Egeria densa treatment **sites** ❑ **Select potential sites** to treat ❑ **Select** the most efficacious treatment **methods** with the least environmental impact(s) from the available treatment options	❑ Determine appropriate timing and logistics for the selected treatment method ❑ **Perform** the *Egeria densa* **treatment**	❑ **Measure** the environmental impacts and efficacy of the treatment method. Evaluate and analyze data and findings. Modify future treatment methods, if necessary ❑ Report monitoring results to appropriate regulatory agencies and stakeholders.

Appendix 5 – Application Area and Treatment Area Diagram

EDCP APPLICATION AREA AND TREATMENT AREA DIAGRAM
INCLUDING SAMPLING STATION LOCATIONS
AS OUTLINED IN EDCP MONITORING PLAN

Appendix 6 – DBW Monitoring Plan

EGERIA DENSA CONTROL PROGRAM MONITORING PLAN

Background

Water quality analysis (using test procedures specified in 40 CFR Part 136) is required by the National Pollution Discharge Elimination System Aquatic Pesticide (NPDES) Permit (CAG 990005; Water Quality Order No. 2013-0002-DWQ) for selected constituents and parameters to demonstrate full restoration of water quality and protection of beneficial uses of the receiving waters following project completion. Analyses shall include the following constituents and parameters as outlined in the permit:

1. Herbicide active ingredients
2. Dissolved oxygen
3. Temperature
4. pH
5. Turbidity
6. Electrical Conductivity
7. Salinity
8. As necessary, water hardness and other water quality parameters that may influence pesticide persistence or toxicity,
9. As necessary, additional chemical panel screens to determine if non-program related chemicals are present in water column.

EDCP Monitoring Plan

The NDPES Permit requires that the Discharger follow a specified monitoring and reporting program (MRP) as outlined in the NDPES Permit, Attachment C & D. The EDCP Monitoring Plan specifically outlines how the NDPES MRP will be executed. Water quality analysis performed on samples that the DBW collects as part of water quality monitoring for the EDCP will follow test procedures specified in 40 CFR Part 136. The detailed water quality sampling protocol that follows is organized as follows:

A. Sampling definitions
B. Monitoring records and geographic referencing
C. Sampling analysis
D. Sample selection/monitoring frequency
E. Field description and conditions document
F. Water sampling equipment and general water collection procedures
G. Field sampling quality control
H. Water quality monitoring
I. Sampling intervals
J. Sampling stations

A. Sampling Definitions

The NPDES (Order No. 2013-0002-DWQ), Attachment A defines many of the terms associated with monitoring and is attached to this EDCP Monitoring Plan. Some definitions must be further defined by DBW. The following definitions are specific to the EDCP Monitoring Plan in compliance with Water Board definitions.

- *Application Area* – The portion of water body designated for direct application of aquatic herbicide for aquatic weed treatment.

- *Treatment Area* – The portion of water body outside of the application area that is expected to contain herbicide residue resulting from treatment activities and be actively treating the target species. This area can vary depending on hydrology, density of submerged plant matter, tide cycle, and season. It is estimated the buffer zone can vary from 10 to 100 feet from edge of application area.

- *Treatment Site* – A treatment site is a geographic area that could potentially have a portion of acreage treated with herbicide to control *Egeria densa*. A Treatment Area is within a Treatment Site.

- *Site Number* – The DBW has assigned a site number to each place name in the Delta. For example the site number for Rhode Island is 99. Regulating agencies have been provided with maps that identify the Site Number for each Treatment Site.

- *Receiving waters* –The area or time frame beyond which the aquatic herbicide is "at a sufficient concentration to actively kill or control target weeds". When active ingredient concentrations are below the effective concentration, the aquatic pesticide becomes a residue. The receiving water includes "anywhere outside the treatment area at anytime and anywhere inside the treatment area after completion of the treatment event" when herbicide levels are below a sufficient concentration to actively impact target weeds.

- *Upstream/Downstream* – The monitoring and reporting program directs sampling to occur in relation to upstream and downstream locations. The Delta is a semi-diurnal tidal environment with flow changing approximately every 12 hours. This means the location of up and down stream in relation to the application/treatment area changes every 12 hours. Upstream thus means upflow of the incoming or outgoing tide. Downstream means downflow of incoming or outgoing tide. Slack tides occur approximately 30-50 minutes going into and out of low and high tides (depending on Delta location). Slack tide conditions exist when there is no apparent movement of water in one direction or another. Tidal conditions including flow direction will be indicated in documentation.

- *Treatment Event* – A treatment event refers to when and how much herbicide is used in an application area and how long it remains at a "sufficient concentration to actively kill or control target weeds". In the NDPES permit monitoring plan,

"treatment" and "application" are used interchangeably. Treatment events are based on herbicide label guidelines. Diquat applications are completed in one day. However, diquat, a liquid herbicide, may remain in the water column at sufficient levels to actively control target weeds up to 5 days. Fluridone applications span an 8 to 12 week period and may "actively kill or control target weeds" up to 4 weeks after the last application has been made. Fluridone applications can occur twice a week in this period (as is common for liquid applications), be applied weekly, or every other week (as is common for pellet applications). It is common for fluridone to remain active in the water 2-4 weeks after the last application because it is designed to "release" into the water body over a prescribed period of time. All Pest Control Recommendations indicate the treatment event timing for each planned application. Sampling events are scheduled based on the planned treatment event and the applicable regulatory agencies sampling interval requirements.

- *Sampling Event* – 24 to 48 hour period under which water sampling and water quality parameters are measured at designated sampling stations in or adjacent to the herbicide application/ and treatment area.

- *Sampling Station* – The location where water samples and other water quality parameters are collected. Each sampling event has a minimum of 3 sampling stations. "A" is located inside of application area approximately ⅓ to ¼ the distance in from downstream edge of application polygon. "B" is located on the downstream edge of the treatment area in receiving waters. "C" is located in an adjacent, non-impacted location with similar hydrology to the receiving waters sampling station "B".

- *Adjacent, Non-impacted* – Delta water parameters fluctuate widely under normal seasonal, diurnal, and tidal variances. This is documented in U. S. Geological Survey, California Department of Water Resources, California Department of Fish and Wildlife, and Interagency Ecological Program water quality data. Given that water quality parameters usually have changed substantially 4-8 weeks after initial sampling has begun, an adjacent, non-impacted sampling station is used to determine background water quality conditions—standards that treatment areas should match. Sampling Station C acts as a control, an indicator of normal conditions in the Delta based on time of year, time of day, and tidal cycle.

B. Monitoring Records and Geographic Referencing

Records of monitoring information shall include the following:

- The date, exact place and time of sampling or measurements;
- Tidal flow direction at time samples collected and time of nearest high or low tide
- The sample identification numbers and sample station where collected;
- The identification numbers of all QA/QC samples collected;
- The individuals who performed the sampling or measurements;
- Copies of chain of custodies for all requested lab analysis
- The dates analyses were performed;

- The lab quality control measures that were implemented;
- The individuals who performed the analyses;
- The analytical techniques or method used; and
- The results of such analyses.

Each application at each site is captured electronically using GPS technology and ArcPad ® GIS applications. The DBW maintains a geodatabase and can produce electronically or on paper, representative maps with metric scale that show the application area, calculated acreage, treatment area, immediate adjacent untreated area, receiving waters, and sampling stations as defined in section "A" of this document. Prior to application, surface area and volumes are calculated and also included on Pest Control Recommendations (PCR's). All PCR's are submitted for approval to the appropriate county Agriculture Commissioner prior to the beginning of a treatment event.

C. Sampling Analysis

"All analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services." The primary lab used to analyze chemical residue and conduct additional chemical panel screens for the EDCP is the California Department of Agriculture-Center for Analytical Chemistry (CDFA-CAC). Outside labs are contracted on annual basis per the State of California business contracting guidelines and the EDCP Quality Assurance Project Plan(QAPP).

"All analyses shall be conducted in accordance with the latest edition of *Guidelines Establishing Test Procedures for Analysis of Pollutants* (Guidelines), promulgated by the U.S. Environmental Protection Agency (USEPA) 40 CFR Part 136." The CDFA-CAC has established Standard Operating Procedures in accordance with 40 CFR Part 136. These have been incorporated into the EDCP QAPP and cover all required quality control/quality assurance processes for lab handling, residue analysis, and results reporting.

The DBW may add, as needed, an additional chemical panel that screens 537 known pesticides. In the past this panel has been run on water samples associated with toxicity concerns. The screen is used to determine other non-program-associated pesticides that may be present in a water sample. Any additional analyses shall be included in the annual monitoring report.

D. Sampling Selection/ Monitoring Frequency

Currently, the EDCP conducts less than 30 applications [treatment events] annually. These applications [treatment events] currently occur only in estuarine water bodies with a semi-diurnal tidal cycle. The NDPES requires water sample collection at a minimum of six sampling events for each active ingredient, in each environmental setting (flowing water vs. non-flowing water) per year. Since the EDCP conducts all treatments in the tidally influenced Delta, the environmental setting of non-flowing water is not applicable to the monitoring program. If there are less than six application events in a year, samples will be collected for each application event for each active ingredient.

E. Water Sampling Equipment and General Water Collection Procedures

- ❑ Each grab sample is collected using a MasterFlex® E/S Portable Sampler fitted with 7-10 feet of tubing (thermoplastic elastomer) that is weighted at the loose end. Water is drawn through the sampler up the tubing. The main water sample and replicates or splits are collected simultaneously in Water Board approved sample bottles.
- ❑ All samples are collected using sampling procedures that minimize loss of organic compounds during sampling collection and analysis and maintain sample integrity. The EDCP outlines all standard operating procedures for lab handling and analyses in the EDCP QAPP.
- ❑ All water samples are collected in the water column location where the greatest amount of residue is anticipated. "Each grab sample is collected at three feet below water surface, or mid depth if water body is less than six feet." All water quality parameters are measured at the depth that the water sample is collected.

F. Field Sampling Quality Control

- ❑ Contamination from surface water residues and from one sampling station to the next shall be minimized: All persons collecting water samples shall wear latex or vinyl gloves to prevent bottle contamination. Gloves shall be changed at minimum at each sampling station. No part of sample bottle shall be in contact with surface of water body. After sample for chemical residue analysis is collected, excess water shall be dried off bottle, and each sample and its replicate shall be placed in Ziploc baggies.
- ❑ Persons collecting samples will ensure sampler and bottles are "backgrounded to the water at each sampling station. Sampler shall be run for a minimum of one minute before samples are collected. All bottles shall be rinsed three times before sample is collected in bottle.
- ❑ Equipment blanks will be collected before the beginning of each sampling event. Post samples have an additional equipment blank collected between the inside sampling station and the receiving waters sampling station. An equipment blank is collected first by running diluted Alconox ® anionic detergent or a Water Board approved equivalent through the sampler for approximately 30 to 60 seconds to clean sampler. Then clean de-ionized (or reverse osmosis) water is run through the sampler approximately 30 seconds before an equipment blank and equipment blank duplicate are collected. Bottles are rinsed 3 times with de-ionized water before collecting equipment blank sample.
- ❑ Tubing used in the sampler shall be changed with every sampling event or more often if equipment blanks detect residue and additional cleaning does not result in a clean equipment blank. After each sampling event, the equipment will be cleaned by 1) running water through it for 5 to 10 minutes at a location where an herbicide application has not recently occurred, and 2) running distilled or ionized water through it for 30 seconds.
- ❑ 10 percent of all samples collected shall be splits or dual analysis. Dual analysis samples shall be submitted to the CDFA-CAC lab blind with different identification numbers. Splits shall be submitted to an outside lab (according to QAPP procedures). All splits and duplicates shall be collected simultaneously.

- 10 percent of all sampling events will be accompanied with a field spike and field blank. Water samples for field blank and spike will be collected at first pre-sample as a dual sample (identical water). One sample will be spiked with appropriate herbicide standard. Standards are made up at the beginning of each season by the CDFA-CAC lab and sealed to preserve chemical integrity of active ingredients. A separate set of gloves will be used to prepare field spike, then disposed. All field blanks and spikes shall accompany regular samples. All standards shall be disposed of properly such that regular samples are not contaminated.

H. Water Quality Monitoring

Chemical, physical, and visual water quality parameters will be monitored at each sampling station where a water sample is collected as indicated in **Table 1**. All physical and chemical water quality parameters will be monitored at three feet below the surface, or mid-depth if water body is less than six feet deep. Water quality parameters will be monitored a minimum of two more times in a 3 to 4 week period following the end of an herbicide treatment event. Follow-up visual inspections are to determine water quality parameters after herbicide applications. Historically, application impacts have not extended much beyond a month after the final application in a treatment event.

TABLE 1: WATER QUALITY PARAMETERS			
SAMPLE TYPE	**PARAMETER/CONSTITUENT**	**SAMPLE METHOD**	
Chemical[5]	Diquat	Lab analysis	Liquid chromatography analysis on field-collected water sample
	Endothall		
	Fluridone		
	Penoxsulam		TBD
	Imazamox		
	Dissolved oxygen	Environmental monitoring: field testing	Multi-probe datasonde
Physical	pH	Environmental monitoring: field testing	Multi-probe datasonde
	Temperature		
	Turbidity		
	Electrical conductivity		
	Salinity		
Visual	Site description—type of water body	EDCP daily crew monitoring—all applications; Environmental monitoring—sampling event locations	Description from pre-determined categories
	Appearance of water body		
	Weather conditions		

[5]Nonylphenol or other adjuvants are not sampled as the EDCP program does not use adjuvants.

Chemical and physical water quality parameter data (except for active ingredients) are measured and collected using a Hydrolab® Model MS5 multi-probe datasonde. Calibration for dissolved oxygen (DO), pH, electrical conductivity, and turbidity sensors are conducted weekly. Dissolved oxygen membranes are examined before each use and changed if fouling is apparent or dissolved oxygen readings are unstable. Hydrolab® guidelines require calibration every 2-3 weeks and more often if equipment readings indicate. Data is captured electronically using Hydroplus® ArcPad® software. This data capture automatically records geographic position with water quality parameter data. If there are operational problems with the Hydrolab, a Hach HQ-10 Dissolved Oxygen Meter is used to measure temperature and dissolved oxygen.

I. Sampling Intervals

- *Background monitoring*—"Background samples shall be collected upstream at the time of the application [treatment] event or they can be collected at the

treatment area just prior (up to 24-hours in advance of application) to the application [treatment] event." The background monitoring will be inside the application/treatment areas (Sampling Station A), and in receiving waters (Sampling Station B). However, as the beginning and ending of a treatment event for fluridone is extended over a period of several weeks, fluridone will have an additional sample station (Sampling Station C) in an adjacent non-impacted location to provide comparison water quality data to receiving water conditions. All background monitoring will be called "pre-samples" and identified by the number 1 and sampling station letter of A, B, or C.

- *Event monitoring* – "Event monitoring samples shall be collected immediately downstream (see definition) of the treatment area in flowing waters or adjacent to the treatment area in non-flowing waters immediately after the application event or shortly after application, but after sufficient time has elapsed such that treated water will have entered the adjacent or downstream area." In the Delta herbicides do not immediately enter the "receiving waters". All event monitoring will be called post-samples and be identified by the number 2 and sampling station letter A, B, or C.
    - *Liquid formulations* – Liquids are injected into the water in the application area, mix in the water column and move into the treatment area before moving into the receiving waters. EDCP EIR studies and past water quality monitoring data indicate that this interval is approximately between 1 and 3 hours after application has occurred depending on 1) <u>time</u> during a tidal cycle herbicide is injected into the water, and 2) the biomass and density of *Egeria densa*. Water samples will be collected 1-3 hours after application has occurred for diquat and liquid fluridone.
    - *Pellet formulations* – Pellets are dispersed with a broadcast spreader into the water. Pellets are designed to slowly release active ingredients over a specified time period. It is estimated that pellets do not begin releasing into the water column for approximately 1-2 weeks after dispersal. Peak dispersal occurs between weeks 6-8. Water samples will be collected one week after final application during estimated peak week of release.
- *Post-Event monitoring* – "Post event samples shall be collected within the treatment area and immediately downstream (see definition) of the treatment area in flowing waters or adjacent to the treatment area in non-flowing waters one week after the application [treatment] event." All post-event monitoring will also be called post-samples and be identified by the number 3 and sampling station letter A, B, C. Any additional post-event monitoring that may occur will be consecutively numbered 4, 5, and so forth.
    - Liquid formulations – As liquid diquat is a discrete application treatment event, post event monitoring will occur no more than 7 days after a treatment event is completed. Liquid fluridone is a multiple application treatment event. Post event monitoring would occur within 7 days of the final application of herbicide (approximately 6-8 weeks after first application occurs).
    - Pellet formulations – Pellets are designed to slowly release active ingredients over a specified time period. The manufacture has reported

that herbicide can remain actively controlling target species up to one month after last application in application/treatment area. Historically DBW has found herbicide present at levels that can actively treat the target species for 3-4 weeks after the final application in a multiple application treatment event (6-8 weeks). A post event monitoring sample will be collected starting one week after the final application of fluridone pellet. For fluridone applications, post treatment sampling events will be conducted until sample analyses result in “non-detects” (i.e. < 1ppb) of herbicide residue.

J. Sampling Stations

Each sampling event will consist of water quality data and water sample collection at a minimum of three sampling stations (see definition). See **Table 3** for a summary of sampling station locations and data collected.

TABLE 3: SUMMARY SAMPLING STATION MONITOIRNG

Sampling Station	Location of Station	Return interval	Timing of sample collection	Water sample collected (yes/no)	Equipment blank prior to sample collection (yes/no)	Field spike/Field blank (yes/no)	Muti-probe Datesonde (yes/no)
A	Inside of application/ treatment area, approximately 1/3 distance in from downstream edge of application polygon	1	Pre	Yes	Yes	Yes, only for 10% of sampling events	Yes
		2	Post	Yes	Yes	Yes	Yes
		3	Post	Yes	Yes	Yes	Yes
		4	Post-Visual	No	No	No	Yes
B	The downstream edge of treatment area in receiving waters	1	Pre	Yes	No	No	Yes
		2	Post	Yes	Yes	No	Yes
		3	Post	Yes	Yes	No	Yes
		4	Post-Visual	No	No	No	Yes
C	Adjacent, non-impacted	1	Pre	No	No	No	Yes
		2	Post	Yes	Yes	No	Yes
		3	Post	Yes	Yes	No	Yes
		4	Post-Visual	No	No	No	Yes