Attachment E – Notice of Intent

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

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

I. NOTICE OF INTENT STATUS (see Instructions)

Mark only one item

☑ A. New Applicator

☐ B. Change of Information: WDID # _____

☐ C. Change of ownership or responsibility: WDID# _____

II. DISCHARGER INFORMATION

A. Name Eight Mile Development, Inc

B. Mailing Address 10100 Trinity Parkway, 5th Floor,

C. City Stockton

D. County San Joaquin

E. State CA

F. Zip Code 95219

G. Contact Person Kelly Rogers

H. Email address Kelly Rogers <krogers@agspanos.com>

I. Title Land Development Manager

J. Phone (925) 324-1141

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

A. Name _____

B. Mailing Address _____

C. City _____

D. County _____

E. State _____

F. Zip Code _____

G. Email address _____

H. Title _____

I. Phone _____

IV. RECEIVING WATER INFORMATION

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

☑ 1. Canals, ditches, or other constructed conveyance facilities owned and controlled by Discharger.

Name of the conveyance system: Exhibit A.

☐ 2. Canals, ditches, or other constructed conveyance facilities owned and controlled by an entity other than the Discharger.

Owner's name: _____

Name of the conveyance system: _____

☐ 3. Directly to river, lake, creek, stream, bay, ocean, etc.

Name of water body: _____

B. Regional Water Quality Control Board(s) where application areas are located (REGION 1, 2, 3, 4, 5, 6, 7, 8, or 9): Region 5

(List all regions where algaecide and aquatic herbicide application is proposed.)

V. ALGAECIDE AND AQUATIC HERBICIDE APPLICATION INFORMATION

A. Target Organisms:
Exhibit A

B. Algaecide and Aquatic Herbicide Used: List Name and Active Ingredients
Exhibit A

C. Period of Application:

Start Date 4-1 End Date 9-1

D. Types of Adjuvants Used:
Exhibit A

VI. AQUATIC PESTICIDE APPLICATION PLAN

A. Has an Aquatic Pesticide Application Plan been prepared and is the applicator familiar with its contents?

☑ Yes ☐ No

If not, when will it be prepared? Exhibit A

VII. NOTIFICATION

Have potentially affected public and governmental agencies been notified?

☑ Yes ☐ No

VIII. FEE

Have you included payment of the filing fee (for first-time enrollees only) with this submittal?

☑ Yes ☐ No ☐ NA

IX. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I certify that the provisions of the Order, including developing and implementing a monitoring program, will be complied with."

A. Printed Name: Kelly Rogers

B. Signature: Kelly Rogers Date: 6/24/24

C. Title: Land Development Manager

XI. FOR STATE WATER BOARD STAFF USE ONLY

WDID: Date NOI Received: Date NOI Processed:

Case Handler's Initial: Fee Amount Received: $ Check#:

☐ Lyris List Notification of Posting of APAP Date: Confirmation Sent

EXHIBIT A

AQUATIC PESTICIDE APPLICATION PLAN (APAP)

For the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications, to meet the aquatic vegetation management requirements of lakes listed in Chapter 6 herein.

Prepared By:
Waterworks Aquatic Management, Inc.
4120 Douglas Blvd. Suite #306-353
Granite Bay, CA 95746

For:
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

AUGUST 2024

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CHAPTER 1

INTRODUCTION

The Aquatic Pesticide Application Plan (APAP) portion of this Integrated Aquatic Vegetation Management Plan is a comprehensive plan developed for a NPDES Permit and to comply with the provision of Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Water of the United States, General Permit No. CAG990005, adopted by the State Water Resource Control Board on May 20, 2004.

This Aquatic Pesticide Application Plan (APAP) describes the project, the need for the project, what will be done to reduce water quality impacts, and how those impacts will be monitored.

The use of aquatic pesticides within the Waterworks Aquatic Management, Inc. Vegetation Control Program for the lakes listed in Chapter 6 herein is necessary to manage the lake resources and maintain beneficial uses that include flood control, recreation, and aesthetics. The Aquatic Vegetation Control Program is an undertaking necessary to control specific types of nuisance aquatic vegetation at an acceptable level in the treatment area being managed. The need for aquatic pesticide application events as part of this program vary from week to week and from season to season due to such things as water temperature, sunlight, and other factors. It is a balancing act between managing resources and impairing resources. This APAP per the General Permit requirements, along with the other governmental regulatory programs described below, provide different pieces to ensure this balancing act is successful.

BACKGROUND INFORMATION

Per the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the USEPA has sole jurisdiction of pesticide label language. Label language and any changes thereto must be approved by USEPA before the product can be sold in this country. As part of the labeling process, USEPA evaluates data submitted by registrants to ensure that a product used according to label instructions will cause no harm (or “adverse impact”) on non-target organisms that cannot be reduced (or “mitigated”) with protective measures or use restrictions. Registrants are required to submit data on the effects of pesticides on target pests (efficacy) as well as effects on non-target pests. Data on non-target effects include plant effects (phytotoxicity), fish and wildlife hazards (ecotoxicity), impacts on endangered species, effects on the environment, environmental fate, breakdown products, leachability, and persistence; however, FIFRA is not necessarily as protective of water quality as the Clean Water Act (CWA).

The California Department of Pesticide Regulation (DPR) is responsible for reviewing the toxic effects of aquatic pesticide formulations and determining whether a

pesticide is suitable for use in California's waters through a registration process. To do this, DPR also reviews data submitted by the registrants. While DPR cannot require manufacturers to make changes in labels, DPR can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label. Consequently, requirements that are specific for use in California are included in many pesticide labels that are approved by USEPA.

DPR also licenses applicators of pesticides designated as a "restricted material". To legally apply these pesticides, the applicator must be a holder of a Qualified Applicator Certificate or work under the supervision of someone who is certified. For aquatic pesticides, the qualified Applicator Certificate must have the category "Aquatic."

State regulations require that the County Agricultural Commissioners (CACs) determine if a substantial adverse environmental impact will result from the proposed use of a restricted material. The CAC implements this by issuing Use Permits for the application of pesticides considered as restricted materials. In evaluating local conditions, CACs may use information supplied by DPR, which suggests permit conditions that reflect minimum measures necessary to protect people and the environment. State regulations require that specific types of information be provided in an application to the CACs for a pesticide use permit. The CACs review the application to ensure that appropriate alternatives were considered and that any potential adverse effects are mitigated. The CACs also conduct pre-project inspections on at least five percent of projects.

PERMIT COVERAGE

The General Permit addresses the discharge of aquatic pesticides related to the application of 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, and triclopyr-based aquatic pesticides to surface waters for the control of aquatic weeds. Aquatic pesticides that are applied to application areas within waters of the United States in accordance with FIFRA label requirements and Use Permit restrictions are not considered pollutants. However, pollutants associated with aquatic pesticide applications require coverage under the General Permit. These include over-applied or misdirected pesticide products and pesticide residues. Residues are any pesticide byproduct, or breakdown product, or pesticide product that is present after the use of the use of the pesticide to kill or control the target weed.

The General Permit does not cover agricultural storm water discharges or return flows from irrigated agriculture because these discharges are not defined as "point sources" and do not require coverage under an NPDES permit. The General Permit also does not cover other indirect or non-point source discharges from applications of pesticides, including discharges of pesticides to land that may be conveyed in storm water or

irrigation runoff. The General Permit does not cover the discharge of pollutants related to applications of pesticides other than 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, and triclopyr based pesticides; however, the General Permit includes a re-opener statement specifying that the permit may be reopened for the specific purpose of modifying the list of pesticides whose associated discharge is authorized by this General Permit.

WATERS OF THE UNITED STATES

The General Permit regulates the discharge of pollutants associated with the application of aquatic pesticides to waters of the United States. "Waters of the United States" include all waters; all other waters the use, degradation, or destruction of which would or could affect interstate or foreign commerce. Waters of the United States include waters used by interstate or foreign travelers for recreation, waters from which fish or shellfish are taken and sold in interstate or foreign commerce, impoundments of and tributaries to waters of the United States include, but are not limited to, irrigation and flood control channels that exchange water with waters of the United States. Surface water impoundments include, but are not limited to, drinking water reservoirs, ornamental lakes and ponds, and impoundments used to store irrigation water.

WATER QUALITY STANDARDS

The Clean Water Act (CWA) defines Water Quality Standards as "Provisions of state or federal law which consist of designated uses for the waters of the United States, water quality criteria for waters based upon such uses, and anti-degradation policies. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act. "(40 Code of Federal Regulations (CFR) section 131.3(i)).

In California, Water Quality Control Plans designate the beneficial uses of waters of the State and water quality objectives (WQOs) to protect those uses. The Water Quality Control Plans are adopted by the State and Regional Boards through a formal administrative rule-making process, and, upon approval by USEPA, the WQOs for waters of the United States (generally surface waters) become State water quality standards.

USEPA has established water quality criteria in California for priority pollutants in the National Toxics Rule and the California Toxics Rule (CTR). The CTR criteria are also water quality standards.

EFFLUENT LIMITATIONS

NPDES permits for discharges to surface waters must meet all applicable provisions of sections 301 and 402 of the CWA. These provisions require controls that utilize best

available technology economically achievable (BAT), best conventional pollutant control technology (BCT), and any more stringent controls necessary to reduce pollutant discharge and meet water quality standards.

Title 40, CFR section 122.44 states that if a discharge causes, has the reasonable potential to cause, or contributes to an excursion (Reasonable Potential) of a numeric or narrative water quality criterion, the permitting authority must develop effluent limits as necessary to meet water quality standards. Title 40, CFR section 122.44(k)(3) allows these effluent limits to be requirements to implement BMPs if numeric effluent limits are infeasible. It is infeasible for the State Board to establish numeric effluent limitations in the General Permit because the application of aquatic pesticides is not necessarily considered a discharge of pollutants according to the Talent decision. The regulated discharge is the discharge of pollutants associated with the application of aquatic pesticides. These include over-applied and misdirected pesticide products and pesticide residue. At what point the pesticide becomes a residue is not precisely known and varies depending on such things as target weed, water chemistry, and flow. Therefore, in the application of aquatic pesticides, the exact effluent is unknown. It would be impractical to treat the numerous short duration intermittent pesticide releases to surface waters from many various locations; and Treatment, in many cases, may render the pesticide useless for aquatic weed control.

Therefore, the effluent limitations contained in the General Permit are narrative and include requirements to develop and implement this APAP that describes appropriate BMPs, including compliance with all pesticide label instructions, and to comply with receiving water limitations.

The BMPs required herein constitute BAT and BCT and will be implemented to minimize the area and duration of impacts caused by the discharge of aquatic pesticides in the treatment area and to allow for restoration of water quality and protection of beneficial uses of the receiving waters to pre-application quality following completion of a treatment event.

Once an aquatic pesticide has been applied to an application area, the pesticide product can actively treat the target species within the treatment area. During the treatment event, the aquatic pesticide is at a sufficient concentration to actively kill or control target weeds. When active ingredient concentrations are below this effective concentration, the aquatic pesticide becomes a residue. The minimum effective concentration, and the time required to reach it, vary due to site specific conditions, such as flow, target species, and water chemistry. The Receiving Water Limitations requires that an application event does not result in an exceedance of water quality standards in the receiving water. The receiving water includes:

- Anywhere outside of the treatment area at any time, and

- Anywhere inside the treatment area after completion of the treatment event.

In recognition of the variability in the temporal extent of a treatment event, the General Permit does not require it to be discreetly defined. Instead, post-event monitoring of the water is required no more than a week from the time of aquatic pesticide application.

To protect all designated beneficial uses of the receiving water, the most protective (lowest) and appropriate (to implement the CTR criteria and WQOs in the Water Quality Control Plans) limit should be selected as the water quality limit for a particular water body and constituent. In many cases, water quality standards include narrative, rather than numerical, water quality objectives. Cases, water quality standards include narrative, rather than numerical, water quality objectives.

In such cases, numeric water quality limits from the literature or publicly available information may be used to ascertain compliance with these standards.

For acrolein and copper, the freshwater aquatic life protection objective (in Water Quality Control Plans) and criterion (from CTR) are applicable. For 2,4-D, diquat, endothall, fluridone, and glyphosate, the most protective limits are those for the protection of the MUN beneficial use.

The resulting numeric limits shall be used to assess impacts from pollutants associated with aquatic pesticide application on the quality of waters of the State and the beneficial uses that they are able to support. The absence of WARM or COLD criteria for a constituent does not mean that those beneficial uses or other beneficial uses are absent in the receiving water. It simply means that there are no State or USEPA-based numeric water quality objectives or criteria to implement those beneficial uses. This is the case for 2,4-D, diquat, fluridone, and glyphosate.

MONITORING REQUIREMENTS

The General Permit requires dischargers to comply with the Monitoring and Reporting Programs (MRP) outlined in the General Permit's. The goals of the MRP are to:

- Determine compliance with the receiving water limitations and other requirements specified in the General Permit.
- Measure and improve the effectiveness of the APAP.
- Support the development, implementation, and effectiveness of BMPs.
- Assess the chemical, physical, and biological impacts on receiving water resulting from aquatic pesticide applications.
- Assess the overall health and evaluate long-term trends in receiving water quality.

- Demonstrate that water quality of the receiving water following completion of resource or weed management projects are equivalent to pre-application projects conducted by the discharger.
- Ensure that projects that are monitored are representative of all pesticides and application methods used by the discharger.

CHAPTER 2

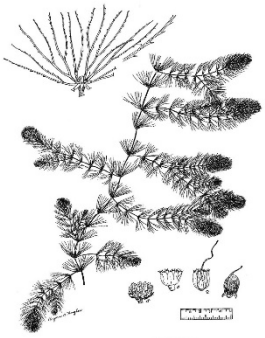
AQUATIC VEGETATION

There are three basic types of aquatic plants: **Submerged** (those found growing below the water line), **Free Floating** (those found floating on the water surface), and **Emergent** (those found growing above the water line). Also, there are three types of Algae: **Attached**, **Filamentous**, and **Planktonic**. A description of the plant types that have been found growing in the water bodies and their presence within each of the systems during the site inspections are as follows:

AQUATIC PLANTS

Submerged:

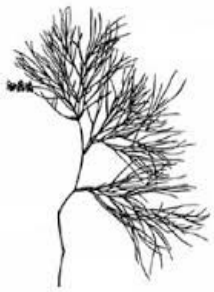
- **Coontail** (Ceratophyllum demersum L.)
  - Species Description: This genus is comprised of perennial plants growing beneath the water surface. Plants produce only one branch per node. Plants lack roots, but branches are sometimes modified as "rhizoids", giving the plants a rooted appearance.



  - Habitat: Coontail grows in slow moving river and streams, ponds, lakes, lagoons, swamps, and irrigation ditches.

  - Problems: Coontail often grows in dense populations and can restrict small boat navigation and recreational water use.

- **Sago Pondweed** (Stuckenia Pectinatus (L.) Boerner)
  - Species Description: Sago Pondweed is a perennial and has thin, creeping rhizomes that are matted and often end in tuberous bulblets. The stem is slender, about 1mm in diameter, simple at the base, but much branched toward the summit. All the leaves are submersed, linear to filiform, 3 to 10 cm long, about 1mm wide.



  - Habitat: Sago Pondweed grows in fresh, alkaline, brackish, or saline waters of lakes, ponds, rivers, streams, irrigation canals and coastal marshes. Sago Pondweed reproduces by seed and propagates by rhizome growth and from bulblets (tubers).

  - Problems: Sago Pondweed sometimes grows in dense colonies that can impede boating and interfere with other types of recreational activities (Tarver et al.

1986, Hoyer et al. 1996). Waterfowl consume the seeds, rhizomes, and bulblets (tubers) of sago pondweed. Because Sago Pondweed is considered to be a valuable food plant for waterfowl, it has been widely planted beyond its original range (muenscher 1944).

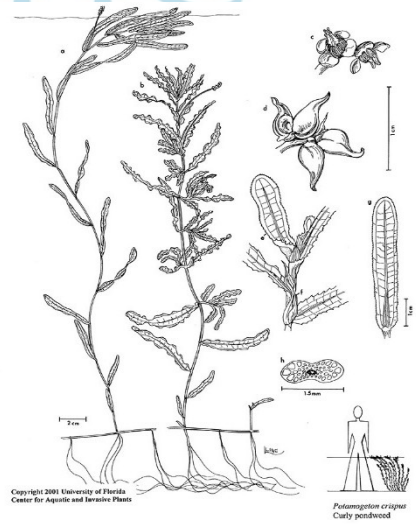
- **American Pondweed** (Potamogeton nodosus poir)

  - Species Description: Floating leaves are oval with base tapered to distinct petiole. Submersed leaves are oval to lance-like, tapered to long petiole. Generally, the plant has sparse leafing. Leaves alternatively arranged on stem.

  - Habitat: American pondweed grows in lakes, reservoirs, ponds, canals, swamps, streams, and small rivers. A primary method of re-growth is from winter buds that are formed in the fall months at the ends of rhizomes.

  - Problems: In shallow areas of lakes, ponds, and reservoirs, colonies of American Pondweed may become dense enough to restrict access to shoreline facilities and restrict activities such as swimming and bank fishing. It also hinders water flow in irrigation canals in some areas of the western United States. However, it also provides benefits by providing shelter and structure for fish and is a food source for a variety of waterfowl and shorebirds (Brooks and Hauser 1978).

- **Curly-Leaf Pondweed** (Potamogeton crispus)



  - Species Description: Curly Pondweed is a perennial and has elongated, slender rhizomes that are buff or reddish. The stems of curly pondweed are flattened. Leaves are entirely submersed, sessile, and oblong to broadly linear, 3 to 8 cm long and 5 to 12 mm wide. The leaf tip is usually rounded and sometimes minutely cuspidate. The leaf margins are finely toothed, undulated, and crisped. Stipules are translucent and soon disintegrating. Bur-like turions that are up to about 5 cm

long often form during the spring and late summer months and consist of three to seven small, thickened leaves that project from the stem at a slight upward angle. Flowers are borne on a short spike that extends above the surface of the water. The fruits are flat, 4 to 6 mm long (including the beak) and have a distinct, pointed beak that is erect or somewhat curved and about 2 to 3mm long.

- Habitat: Curly-leaf pondweed grows in lakes, reservoirs, ponds, rivers, streams, and springs. It can grow in clear to turbid and polluted waters and in alkaline or brackish waters (Stuckey 1979). Curly-Leaf Pondweed produces seeds, but the importance of seeds in the spread and maintenance of populations is unknown (Stuckey 1979). As water temperatures cool during the late summer or fall months, the turions germinate, grow through the winter months with the plants reaching peak biomass in the spring before most other submersed macrophytes begin their growth cycle. Once established, the plants regrow and form colonies from rhizomes.

- Problems: Dense colonies of curly pondweed can restrict access to docks and sport fishing areas during spring and early summer months. Because populations of curly pondweed usually decline during the summer months, it does not directly compete with many of the native submersed species.

- **Watermilfoil** (Myriophyllum spicatum spp.)
  - Species Description: Eurasion watermilfol is a common submerged perennial with creeping rhizomes and finely dissected whorled submersed leaves. The stems can be 12 to 20 ft. long, becoming emergent only while flowering or after stream or canal drawdown when moisture is still present. Submersed leaves are 3 to 6-whorled per node, pinnately dissected into linear lobes.

  - Habitat: Ponds, lakes, rivers, streams, canals, ditches. Usually in still or slow-moving water of streams and rivers.

  - Problems: Can develop colonies that form large sub-surface or surface mats. Mats impede water flow, interfere with boat traffic and recreational activities, create mosquito habitat, and displace native aquatic vegetation.

- **Bladderwort** (Utricularia spp.)
  - Species Description: Bladderwort is type of carnivorous plant that belongs to the bladderwort family. There are 233 species of bladderwort that can be found on all continents, except on Antarctica. Bladderwort has long, horizontal stem that can reach 8 to 80 inches in length and 4 to 10 inches in height. Aquatic species often form dense mats below the surface of the water.

- Habitat: 80% of bladderwort species live on solid ground (terrestrial plants). Remaining 20% of bladderwort are aquatic (live in the water). Bladderwort can be found in the streams, lakes and in the flooded areas. Bladderwort lacks root. Stem either floats freely on the surface of the water or lays flat on the mud.

- Problems: Invasive because of their ability to quickly colonize new areas.

- **Cabomba (Fanwort)** (Caroliniana spp.)
  - Species Description: Has 2 distinctive leaf types: Fan shaped submerge leaves that are divided and arranged oppositely or in whorls along the stem. The floating leaves are small diamond shaped and are not in a pattern. The small white flowers are 1cm in diameter and the flowers are pink to purplish and are about 1/2 inches across. Stems are branched and emerge at intervals from slender roots.

  - Habitat: Sand, mud, gravel lakes, ponds, and streams in depths up to 2.5 meters.

  - Problems: It disrupts a biotic and biotic factor because the weeds get all bunched up and its roots cover a large area. As a result, fish and other aquatic animals get caught in the weeds. When the plant dies there won't be as much oxygen so the fish and other animals will die that way also. Fanwort is one of the most damaging and wide spread invasive plant and costing us the US $600 million dollars from 1906-1991.

- **Hydrilla/Brazilian Elodea** (Hydrilla verticillata spp and Egeria densa spp. respectively)
  - Species Description: Hydrilla and Brazilian elodea are both submerged, rooted, freshwater aquatic plants that survive well in up to six meters of water. They are perennial and tolerate a variety of climatic conditions in lakes, rivers, and streams. Hydrilla stems can reach more than nine meters in length and Brazilian elodea stems can grow to more than five meters. Brazilian elodea leaves usually grow in dense whorls of four leaves, while hydrilla has three to eight, averaging five leaves per whorl. The leaves of Brazilian elodea have smooth edges and no spines on the midrib of the leaf, whereas hydrilla has serrations on the leaf edge and spines or small conical bumps on the midrib of the leaf. Hydrilla can grow more than two meters a week.

  - Habitat: Hydrilla can be found in several areas of California where the waters are influence by hot springs…while Brazilian elodea is found in the more temperate climates of California. They are rooted in the underwater sediment

and clustered near the surface of the water, blocking off sunlight to native plants growing below them.

- Problems: Hydrilla and Brazilian elodea can cause severe reductions in dissolved oxygen concentrations, especially during the warmest months. This results from dense, thick plant canopies that seal off the air-water interface. Additionally, bacteria use oxygen to decompose plants under the canopy. These changes in physical and chemical characteristics of a water body can degrade fish and wildlife habitat and impact food-web interactions.

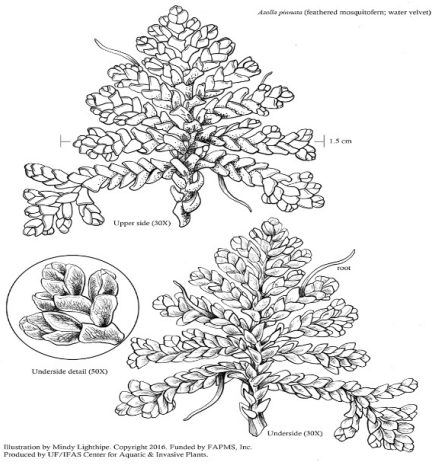
- **Parrot Feather** (Myriophyllum aquaticum spp.)
  - Species Description: Parrot feather is a perennial plant and gets its name from its feather-like leaves that are arranged around the stem in whorls of four to six. The emergent stems and leaves are the most distinctive trait of parrot feather, as they can grow up to a foot above the water surface and look almost like small fir trees.

  - Habitat: Parrot's feather typically grows in freshwater streams, ponds, lakes, rivers, and canals that have a high nutrient content.

  - Problems: While parrot feather may provide cover for some aquatic organisms, it can seriously change the physical and chemical characteristics of lakes and streams. It spreads easily and has become an invasive species and a noxious weed in many areas.

Free Floating

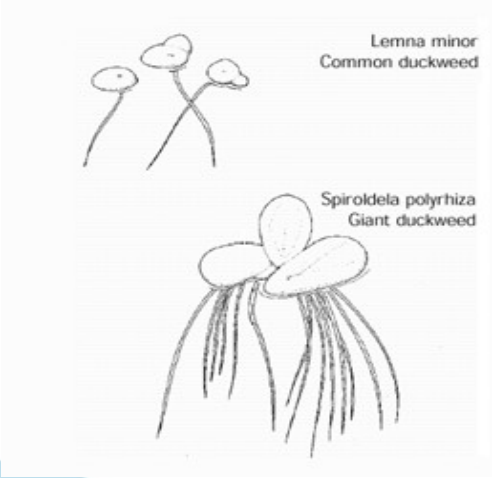
- **Mosquito Fern** (Azolla spp.)
  - Species Description: Plants of mosquito fern are free-floating, small (0.5 to 6 cm long), green to deep red, pinnately and/or dichotomously branched, deltoid in outline, and somewhat moss-like in appearance.



  - Habitat: These species are found in still fresh water of lagoons, swamps, and backwaters or on mud near the water's edge. Plants reproduce asexually by decay of the base of older branches which produces apical fragments.

  - Problems: These species are commonly cultivated in aquaria and decorative pools. The plants often cover large areas and are very conspicuous when massed and often have an obvious red coloration.

- **Duckweed** (Lemna spp.)
  - Species Description: The fronds of Lemna float on the surface of the water (except for L. trisulca which is usually submersed) and occur as solitary fronds or in clusters of 2 to 5 (often more in L. trisulca). The fronds are 1 to 6 mm long, variously rotund, ovate, obovate, oblong, or stipitate in L. trisulca, and have 1 to 3 nerves that are sometimes obsecure. Each frond has a single root except for L. trisulca which is rootless. Flowers are tiny, rarely observed, and borne in two small pouches on each frond.



  - Habitat: Lemna grows on quiet or sluggishly moving waters of ponds, pools, lakes, swamps, streams, drainage ditches, canals, bayous, and sloughs. Plants reproduce vegetatively by a process calling budding where new plants grow from within marginal cavities or pouches along the basal portion of the frond (Landolt 1986). The daughter plants may remain attached to the parent plant for a period of time or repeat the budding process before breaking off. Although rarely seen, duckweed may occasionally flower and produce seed.

  - Problems: Lemna often grows with the other duckweeds (e.g. Spirodela, Wolffia, Wolffiella) and sometimes Azolla. It may form a mat on the surface of the water and shade out submersed plants. These plants are moved by wind and water currents that can cause the mats to become several inches thick. The plants can clog the intakes of potable water supplies and irrigation pumps and can occasionally impede navigation. Like the other genera in the Lemnaceae, Lemna is a valuable waterfowl food plant (Tarver et al. 1986).

- **Water Hyacinth** (Eichhornia crassipes spp.)
  - Species Description: One of the fastest growing plants known, water hyacinth reproduces primarily by way of runners or stolons, which eventually form daughter plants. Each plant additionally can produce thousands of seeds each year, and these seeds can remain viable for more than 28 years. Water hyacinth is a free-floating perennial plant that can grow to a height of 3 feet. The dark green leave blades are circular to elliptical in shape attached to a spongy, inflated petiole. Underneath the water is a thick, heavily branched, dark fibrous root system. The water hyacinth has striking light blue to violet flowers located on a terminal spike.

- Habitat: First reported to be in California in 1904, water hyacinth will grow in a wide variety of aquatic habitats including lakes, ponds, rivers, wetlands and marshes. It will grow most prolifically in water of high nutrient content; it has been used in wastewater treatment facilities. It can withstand drastic fluctuations in water level, flow rates, acidity and low nutrient levels.

- Problems: When not controlled, water hyacinth will cover lakes and ponds entirely; this dramatically affects water flow, blocks sunlight from reaching native aquatic plants which often die. The decay processes depletes dissolved oxygen in the water, often killing fish (or turtles). The plants also create a prime habitat for mosquitoes and a species of snail known to host a parasitic flatworm which causes schistosomiasis (snail fever).

- **Yellow Water Lily** (Nuphar lutea spp.)
  - Species Description: Yellow water-lilies are perennials, flowering from June to September, with strong rootstocks and both submerged and floating leaves. When not flowering, yellow water-lilies can be distinguished from white water-lilies (Nymphaea) by the leaf venation. The leaf veins of yellow water-lily species end at the blade margin and do not form a net-like pattern like those of white water-lily species.

  - Habitat: This aquatic plant grows in shallow water and wetlands, with its roots in the sediment and its leaves floating on the water surface; it can grow in water up to 5 meters deep.

  - Problems: This plant is not considered invasive but may become weedy in some regions or habitats and may displace desirable vegetation if not properly managed.

- **White Water Lily** (Nymphaea alba spp.)
  - Species Description: White water-lily flowers are produced between June and September. They are visited by bees, flies and beetles, but it seems that they are often self-pollinated. The flowers also float; the petals are white, often with a pinkish tinge, and the stamens are bright yellow. The circular floating leaves are dark green on the upper surface, and reddish below. The seeds, which are produced in large quantities, are smooth and olive-green in color.

  - Habitat: This plant roots in the mud at the bottom of lakes and is found in a range of aquatic habitats, including ponds, large ditches, mires and the backwaters of rivers.

- Problems: This plant is not considered invasive but may become weedy in some regions or habitats and may displace desirable vegetation if not properly managed.

- **Water Pennywort** (Hydrocotyle ranunculoides spp.)
  - Species Description: Water pennywort is a perennial, aquatic plant which typically forms dense, interwoven mats of vegetation. The sometimes reddish stems of this species are relatively thick, and can grow up to 35 centimeters in length, generally floating in the water. Hair-like roots branch freely from these at intervals of a few centimeters and remain shallow in the substrate. The fleshy leaves of the floating pennywort are arranged alternately along the stem, and are almost round or kidney-shaped. The floating pennywort produces roundish, flat fruits which are brownish and faintly ribbed.

  - Habitat: It can be found in stagnant and slow-flowing water such as rivers, streams, ponds, lakes, canals and ditches. This species tends to colonize the shallow margins or banks of such water bodies. Once it has become established in such areas, the floating pennywort is then able to spread to deeper water by forming extensive floating carpets of vegetation. The floating pennywort grows on all types of soil, but is known to grow best in high-nutrient sites, and is tolerant of organic pollution.

  - Problems: The floating pennywort reduces the amount of oxygen present in the water, which in turn can lead to fish mortality. Other environmental impacts as a result of the spread of the floating pennywort include the disruption of the movement of animals, an increase in the prevalence of mosquito breeding areas, and increased nutrient loads in the water.

Emergent

- **Cattails** (Typha spp.)
  - Species Description: Cattails are wetland plants with a unique flowering spike, flat blade like leaves that reach heights from 3 to 10 feet. They are one of the most common plants in large marshes and on the edge of ponds. Two species are most common in US: broad leaved cattail (T. latifolia) and narrow leaf cattail (T. angustifolia).

  - Habitat: Cattails prefer shallow, flooded conditions and easily get established along a pond shoreline or in waters one to 1.5 feet or less in depth. When unimpeded however, the cattail beds will expand and can extend their hefty rhizomes well out into pond surface, actually floating above much deeper waters. Cattails need to have “wet feet” during most of the growing season.

- Problems: Cattail is competitively superior under stable water conditions. Maintaining open areas in semi-permanent marshes is difficult once the plant is established. The plant can occur in a variety of natural communities and form extensive monocultures rapidly through vegetative reproduction, thereby reducing plant bio-diversity. Cattail can become a problem in irrigated agricultural lands and managed aquatic systems. The plant invades farm ponds, irrigation canals, and drainage ditches which can result in impeded water flow and increased siltation.

- **Bulrush** (Scirpus spp.)
  - Species Description: There are several species of bulrushes. They are native sedges that resemble, superficially, cattails. Bulrushes are annual or perennial grass-like plants and can grow to 10 feet tall in shallow water or in moist soils. Soft-stem bulrush can grow to 10 feet and grows in dense colonies from rhizomes. Soft-stem bulrush has a round (in cross section), light gray-green, relatively soft stem that comes to a point with no obvious leaves (only sheaths at the base of the stems). Flowers usually occur just below the tip of the stem. Giant bulrush can also grow to 10 feet, is dark green with a hard, triangular stem and no obvious leaves (sheaths at the base of the stems).

  - Habitat: Bulrush grows on mud or in shallow water at the margins of lakes, ditches, ponds and canals, and less commonly beside streams and rivers. It shows a preference for sites that are rich in nutrients. Bulrush seeds are food for wildlife such as ducks, and fish. They provide cover in aquatic habitats for other game as well.

  - Problems: Scirpus species have the potential to form dense stands in wet areas. When growing out of control they are particularly problematic in impeding water flow such as in rice fields and irrigation canals.

- **Creeping water-primrose** (Ludwigia peploides spp.)
  - Species Description: The creeping water-primrose is named for its yellow, primrose-like flowers and its creeping stems, which grow over mud or shallow water. Broken off fragments of the creeping water-primrose's stems can easily re-grow into new plants.

  - Habitat: An adaptable species, the creeping water-primrose can grow under a variety of conditions in a range of still and slow-flowing freshwater habitats.

  - Problems: The creeping water-primrose spreads rapidly and is considered to be invasive in many areas outside of its natural range.

ALGAE

(All lakes have algae present)

- **Filamentous Algae** (Various genera)

  - Species Description: Also known as "pond scum", or "moss", filamentous algae form greenish mats upon the water's surface. This alga usually begins its growth along the edges or bottom of a lake or pond and "mushrooms" to the surface buoyed by the oxygen it has produced. Individual filaments are a series of cells joined end to end which give the thread like appearance.
  - Habitat: Filamentous algae grows in water of marshes, wet ditches, and along the shorelines of rivers and lakes.
  - Problems: Aesthetics, clogging of irrigation systems and water intakes, mosquito habitat.

- **Planktonic Algae** (Various genera)

  - Species Description: Planktonic algae are microscopic plants, usually suspended in the upper few feet of a waterbody, which often reach bloom proportions. Their presence will cause the water to appear pea soup green or brownish in color.
  - Habitat: Planktonic algae grows in lakes, ponds, reservoirs, and backwater areas of river and stream systems.
  - Problems: Aesthetics, taste and odor problems in drinking water reservoirs, natural die off may result in summer fish kills due to oxygen depletion, and some species are toxic to animals and humans.

- **Attached Algae** (Various genera)

  - Species Description: Attached algae are Periphyton; freshwater organisms attached to or clinging to plants and other objects projecting above the bottom sediments. It can sometimes used to assist in determining water quality, and as

a useful environmental indicator for human-induced nutrient enrichment in lakes. Chara and Nitella are the most common attached algae found in these lakes. This gray-green branched algae is oftentimes mistaken for a plant because it has stem and leaf-like structures. They grow submerged, attached to the muddy bottom.

- Habitat: Attached algae grows in lakes, ponds, reservoirs, and backwater areas of river and stream systems.
- Problems: Aesthetics.

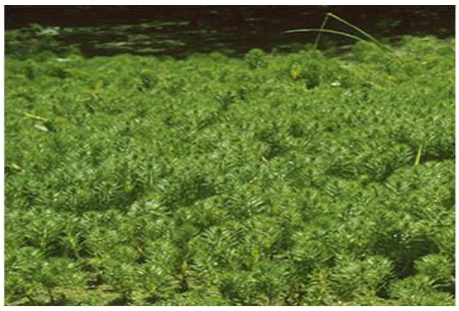
CHAPTER 3

CONTROL TOLERENCES

A plant Density Scale has been developed to support determinations as to when vegetation control measures require implementation. Treatments for the control of submerged aquatic vegetation are implemented in the early spring of each year when plant densities reach a Ranking of 3 per Table 1 below. Spot treatments for the control of algae are implemented prior to nuisance growths developing.

Table 1: Plant Density Scale

Ranking 1 0-10% Coverage Scattered Plants	
Ranking 2 30% Coverage	
Ranking 3 50% Coverage Moderate Plant Growth	
Ranking 4 70-80% Coverage Moderate to Dense Plant Growth	

Ranking 5 100% Coverage Dense Plant Growth	 

AQUATIC VEGETATION CONTROL OPTIONS

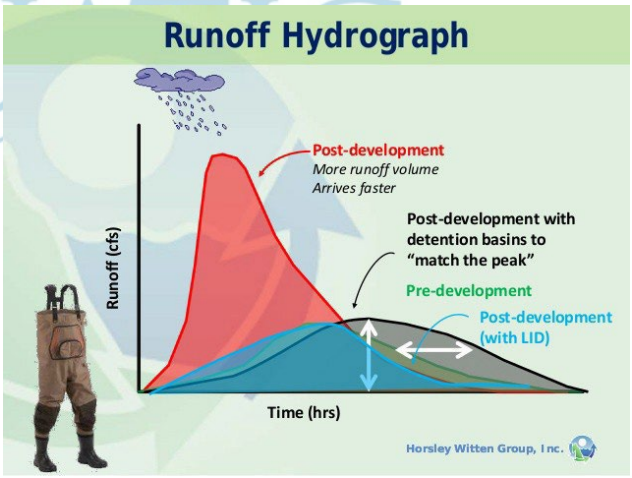
All appropriate aquatic plant management technologies within the context of the identified beneficial uses and impacted areas of the waterbodies have been evaluated, and include all available cultural, biological, mechanical, and aquatic herbicide/algaecide formulations.

Aquatic weed and algae options can be broken down into four basic categories that include:

- **Watershed Management**
- **Biological Control**
- **Physical and Mechanical Control**
- **Aquatic Herbicides and Algaecides**

A discussion on each of the options follows:

- **Watershed Management and the Runoff Impacts**



Watershed management is one of the most important control parameters as it deals with limiting nutrients and runoff into a lake system from the watershed. It entails implementing practices in the watershed that will support the reduction of nutrient and other pollutant runoff into the lake system. Residential and commercial development, with its increasing areas of concrete, asphalt and buildings, leaves more of the urban environment impermeable to rainwater (see table). This leads to an increasing volume of runoff water and a reduced ability for water to naturally infiltrate back into the soil. In natural areas, 10% is runoff and 50 to 60% is direct infiltration. In urban areas, roughly 50 to 60% (at times up to 90%) of all water that falls as rain runs off in urban areas;

only 10 to 15% will actually infiltrate into the ground (Runoff Coefficients for the Rational Method of Estimating Rainfall (McCuen, 1989)). Effect of Development on Hydrograph (Dunne, 1978).

Table 1 Runoff Coefficients for the Rational Method

	FLAT	ROLLING	HILLY
Pavement & Roofs	**0.90**	**0.90**	**0.90**
Earth Shoulders	0.50	0.50	0.50
Drives & Walks	0.75	0.80	**0.85**
Gravel Pavement	**0.85**	**0.85**	**0.85**
City Business Areas	0.80	**0.85**	**0.85**
Apartment Dwelling Areas	0.50	0.60	0.70
Light Residential: 1 to 3 units/acre	0.35	0.40	0.45
Normal Residential: 3 to 6 units/acre	0.50	0.55	0.60
Dense Residential: 6 to 15 units/acre	0.70	0.75	0.80
Lawns	0.17	0.22	0.35
Grass Shoulders	0.25	0.25	0.25
Side Slopes, Earth	0.60	0.60	0.60
Side Slopes, Turf	0.30	0.30	0.30
Median Areas, Turf	0.25	0.30	0.30
Cultivated Land, Clay & Loam	0.50	0.55	0.60
Cultivated Land, Sand & Gravel	0.25	0.30	0.35
Industrial Areas, Light	0.50	0.70	0.80
Industrial Areas, Heavy	0.60	0.80	**0.90**
Parks & Cemeteries	0.10	0.15	0.25
Playgrounds	0.20	0.25	0.30
Woodland & Forests	0.10	0.15	0.20
Meadows & Pasture Land	0.25	0.30	0.35
Unimproved Areas	0.10	0.20	0.30

Note:

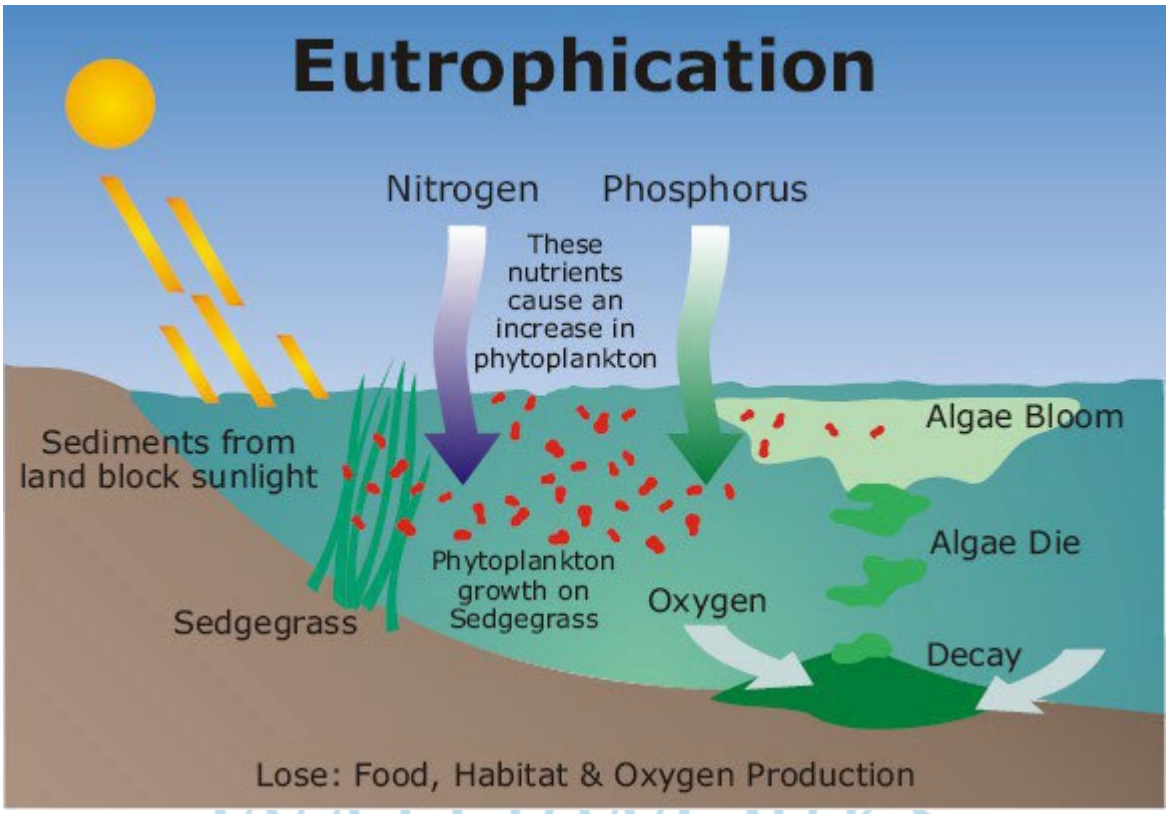
- ***Impervious surfaces in bold***
- *Rolling = ground slope between 2 percent to 10 percent*
- *Hilly = ground slope greater than 10 percent*

- **Runoff Impacts**
  - Non-point source pollution poses the most serious threat to the water quality of urban lakes.
  - Non-point pollution in runoff includes: Sediments, Oil, Anti-freeze, Road salt, Pesticides, Yard waste, and pet and waterfowl droppings.
  - Urban runoff often contains excessive quantities of nutrients that accelerate eutrophication.

- **Nutrient Effects**
  - Increase in algae blooms
  - Odor problems
  - Depletion of oxygen supply
  - Fish kills
  - Decrease in water clarity
  - Increase in the amount of rooted aquatic plants growing in the shallow near shore waters of a lake.

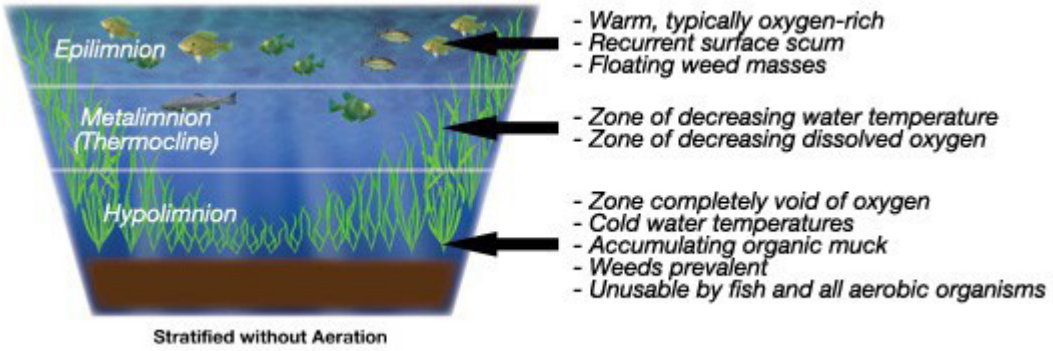
- Reduction in the recreational value of the lake hinders boating, fishing, and reduces overall aesthetics of the lake.

EUTROPHICATION PROCESS AND IMPACTS



Impacts of Eutrophication

- Fish kills due to low oxygen or high metals
- Taste and odor problems, resulting in an increase in water treatment costs
- Floating algae mats, decaying vegetation
- Increased littoral vegetation in shallow areas
- Mobilization of sediment bound metals and ions during anoxic conditions (e.g. copper, ammonia, iron, sulfur, phosphorous)
- Increased temperature
- Reduced water clarity
- Nuisance algal blooms
- Reduced dissolved oxygen in hypolimnion
- Earlier onset and/or longer duration of periods of anoxia in hypolimnion



Bacterial Contaminants

Wildlife can contribute significant amounts of fecal matter to a natural system. Estimates of microbial flora in animal feces have been summarized by Rheinheimer, (1991). Fecal Coliform (FC) and Fecal Streptococci (FS) estimates for duck, mice, rabbits, and chipmunks (average density per gram) were estimated as follows:

- Ducks: FC= 33,000,000 FS= 54,000,000
- Mice: FC= 330,000 FS= 7,700,000
- Rabbits: FC= 20 FS= 47,000
- Chipmunks: FC= 148,000 FS= 6,000,000

Categories of management practices and remedial alternatives to urban lakes

- (http://mnlakes.org/main_dev/news/uniquechallenge.cfm)

Administrative alternatives

- Local governmental units have jurisdiction over land use around urban lakes and can therefore play a key role in the prevention of lake degradation. Several tools are available to control the use and misuse of this land including:
    - Comprehensive plans to guide long-term growth;
    - Zoning Ordinances to regulate land use of private lands;
    - Storm water and Surface Water Management Planning that considers data collection, land use, system site considerations, and design criteria for structures in setting goals for watershed runoff; and
    - Rules for Lake Uses such as where, when and how a lake can be used recreationally to control shoreline erosion, nutrient recirculation and overuse.

- Other administrative alternatives may include the development of fertilizer, yard waste, shoreline erosion and sedimentation control management programs. Education is still probably the best way to combat urban water quality issues.

Non-Structural Alternatives

- Seasonal street cleaning, to capture sediments before they are conveyed through storm sewer systems to lakes and urban best management practices such as buffer strips around water bodies to filter out sediments and reduce nutrients. These are examples of non-structural alternatives. Chemical inactivation/ precipitation of in-lake phosphorous, chemical control of algae, dredging of accumulated sediments, and mechanical harvesting of aquatic vegetation are additional examples.

Structural alternatives

- Storm water detention basins and wetland treatment systems are structural alternatives that detain runoff to control peak flow rates and control downstream flooding. They also allow pollutants to settle out of the water before reaching the lake. Diversions routing storm water away from the lake and in-lake aeration systems to oxygenate the water are other structural alternatives.

SEDIMENT, NUTRIENT, AND ORGANIC LOADING

Urban lakes are typically described as having an excessive growth of weeds and algae, and Watershed Management techniques, or implementation of removal/ inactivation methods are required to address the problem.

Biological Control

- The Triploid Grass Carp as a Biological Control of Aquatic Vegetation:
  The grass carp (or White Amur) Ctenopharyngodon Idella, is a large (125 cm) herbivorous minnow from lowland rivers of the pacific slope drainages of eastern Asia. The grass carp, as a biological control agent for aquatic plants, is considered an attractive long-term method for control of submersed aquatic plants. The Grass Carp has been used successfully for the control of Hydrilla in the imperial Irrigation Districts water delivery system for the past 20 plus years. One of the surrounding issues is the Grass Carps impact on native fisheries, as well as the plant species that it prefers to eat. The California Department of Fish and Wildlife (DFG) began issuing permits for the introduction of the Grass Carp in 2000 for use in lakes and ponds in California. Two of the biggest fears the DFG have about triploid Grass Carp are fish escaping the stocked waters (ponds), and Grass Carp being deliberately introduced into natural waters. The introduction of a non-native species into a native environment can wreak havoc on existing species. The DFG will not issue

a permit for ponds in the Federal Emergency Management Agency (FEMA) 100-year flood plain and it is not clear whether the statewide permit was renewed for stocking outside the area east of the Tehachapi Mountains so their potential use in lakes listed herein is not foreseeable at this time.

Cultural/Physical

- Aeration & Water Quality Alteration: Aeration has been used for decades to circulate water and increase Dissolved Oxygen within lake and pond systems. In stratified lake systems where the bottom layers are anoxic during the summer months, a properly designed aeration system will limit nutrient recycling by supporting aerobic bacteria that support nutrient breakdown in bottom waters and in the hydrosoil. Aeration has proven to be a successful tool for reductions in planktonic algae growth in lakes and reservoirs and is now being studied to evaluate its efficacy on the control of submersed vegetation. Systems vary in size and style from fountains to bottom bubbler diffuser type systems to hypolimnetic units that oxygenate the lower water below the thermocline. Aeration systems have been installed in the lake systems to support water quality improvements.

Shading/light Attenuation

- A basic environmental manipulation for plant control is light reduction or attenuation. This, in fact, may have been the first physical control technique. Shading has been achieved by fertilization to produce algal growth, by application of natural or synthetic dyes, shading fabric, or covers, and by establishing shade trees (Dawson 1981, 1986; Dawson and Hallows 1983; Dawson and Kern-Hansen 1978; Jorga et al. 1982; Martin and Martin 1992; Nichols 1974).
  During natural or cultural eutrophication, phytoplankton growth alone can shade macrophytes (Jones et al. 1983). To limit light penetration and in turn reduce plant growth (Primarily algae), Aquashade or a generic lake dye can be added to a lake or pond system. Aquashade is a blend of blue and yellow dyes specifically designed to screen or shade portions of the sunlight spectrum (red-

orange and blue-violet) required by underwater aquatic plants and algae growth. This action effectively inhibits photosynthesis in young, bottom weed growth. Aquashade or a generic such as Cygnet Select is primarily effective at depths of 2 feet or greater. Inhibition of planktonic algae blooms has also been proven. Aquashade is non-corrosive and will not stain bathing suits, fountain surfaces or other water features at use dilution rates. Dyes also available in black which can be more natural looking.

Benthic Barrier

- Benthic barriers or other bottom-covering approaches are another physical management technique that has been in use for a substantial period of time. The basic idea is that the plants are covered over with a layer of a growth-inhibiting substance or material.

Draw Down

- Draw down, or lake level manipulation can support the reduction of submersed aquatic plant growth when the plants root system is exposed to winter freezing. Draw down should also consider fish spawning requirements in the spring, and the fact that warm winter temperatures in California would not support freezing of the substrate.

Hand Harvesting

- Hand Harvesting of aquatic vegetation by pulling, raking, cutting, or digging can be accomplished in small shoreline areas. Re-growth from seeds and remaining underground plant parts can be expected. Manual removal of aquatic vegetation is time consuming and is not cost effective compared to other available options.

Sediment Removal

- Dredging is usually not performed solely for aquatic plan management, but to restore lakes that have been filled in with sediments, have excessive nutrients, have inadequate hypolimnetic zones, need deepening, or require removal of toxic substances (Peterson 1982). However, lakes that are very shallow due to

sedimentation typically do have excess plant growth. This method is effective in that dredging typically forms an area of the lake too deep for plants to grow, thus opening an area for riparian use (Nichols 1984). By opening more diverse habitats and creating depth gradients, dredging may also create more diversity in the plant community (Nichols 1984).

Mechanical

- **Diver Dredge:** The diver dredging procedure is a mechanical control technology that was pioneered by the British Columbia Ministry of Environment after Eurasian Watermilfoil invaded its waterways in the early 1970s. With only limited numbers of aquatic herbicides registered for use in Canada, the Ministry had to develop alternatives to deal with this noxious weed. Diver dredge programs were developed as an alternative method of control. In the United States, this technology has been used since the mid-1980s, and is effective at removing pioneer colonies of invasive aquatic plants.

- **Harvesting:** Mechanical Harvesting utilizes specialized equipment that cuts and removes aquatic vegetation to a depth of approximately five (5) foot below the water level. When the harvester is full, it transports the harvested vegetation to an onshore unloading location where the plants are conveyed onto a Trailer Conveyor for stockpiling, or dumped on the shoreline, then taken for final disposal. The disadvantages to mechanical harvesting are that the process is expensive, time consuming (the daily harvesting rate is 1-2 acres), and the harvested materials must be hauled away for final disposal. As such, this equipment is often used in high-use/priority areas of lakes, to clear beaches and boat lanes or to provide fishing areas within heavy weed infestations. Equipment such as the “Cookie Cutter” Harvester is utilized for the control of emergent vegetation such as cattails and bulrush. Use of harvesting equipment is limited to large lakes with boat ramp access.

Herbicide and Algaecide Control Options

Aquatic Herbicides and Algaecides sold in California must be registered with the United States Environmental Protection Agency (US-EPA), as well as by the California Department of Pesticide Regulation. Aquatic herbicides and algaecides are reviewed and regulated by US-EPA under the federal Insecticide, Fungicide, and Rodenticide Act (FIFRA 1974; 7 J.S.C. 135 et seq., Public Laws 92-516, 94-140, and 95-356) and recent amendments, and the California Department of Pesticide Regulation.

- Aquatic Vegetation Control Regulatory Requirements for Aquatic Pesticide Use: Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, General Permit No. CAG990005, was adopted by the State Water Resource Control Board on May 20, 2004. Compliance with this NPDES Permit is required for the use of aquatic herbicides and or algaecides to any water body in California that are hydrologically connected to waters of the United States. In addition, U.S. Waters are defined as ". . . waters used by interstate or foreign travelers for recreation, . . . impoundments (Surface water impoundments include, but are not limited to, drinking water reservoirs. . .) of and tributaries to waters of the United States, and wetland adjacent to waters of the United States. Waters of the United States include, but are not limited to, irrigation and flood control channels that exchange water with waters of the Unites States. The lakes listed in Chapter 6 herein discharge into drainage systems that are connected, or potentially connected, to waters of the United States, and by definition meet the criteria as waters of the United States.

- In addition to the NPDES Permit requirements, the California Department of Pesticide Regulation (DPR), as well as the County Agricultural Commissioner's Office regulate the use of aquatic herbicides and algaecides. DPR requires written Pest Control Recommendation (issues by a licensed Pest Control Advisor) for herbicide use in Aquatics, Parks and Right of Ways, companies performing this type of work for hire to have a Pest Control Business License, and their staff are required to be licensed as Qualified Applicators or Certificate holders.

Table 1: The aquatic herbicides and algaecides that are available and their water use restrictions are listed in the table below:

Herbicide* Algaecide*	Water Use Restrictions Days for Swimming	Water Use Restrictions Days for Fish Consumption	Water Use Restrictions Days for Irrigation Of Turf/Food Crops
Aquashade or Cygnet Select (Dye)	0	0	0
Aquathol K (Dipotassium salt of endothall 40.3%)	0	3	7-25
Aquathol Super K (Dipotassium salt of endothall 63.0%)	0	3	7
Cutrine-Plus / Cutrine-Ultra / Captain / Argos Formulation (Copper as Elemental 9.0%)	0	0	0
Captain XTR (Copper Carbonate 15.9%)	0	0	0
Hydrothol 191 (Mono (N, N-dimethylalkylamine) salt of endothol 53%)	0	3	7-25
Komeen (Elemental copper 8%)	0	0	0
Tribune / Reward (Diquat)	0	0	3-5
Renovate (Triclopyr 44.4%)	0	0	7-120
Sonar Formulations (Fluridone)	0	0	0-30
Habitat / Alligare (imazapyr)	0	0	120
Clipper (Flumioxazin)	0	0	1

Seclear (Copper sulphate pentahydrate 16.2%)	**0**	**0**	**0**

Refer to Product Labels and MSDS's for Further Information

A matrix that presents the cost for each available technique, an evaluation of the benefits of deploying that technique, as well as any drawbacks to the use of particular techniques are outlined as follows:

Matrix of Control Options

OPTION	METHOD	PRACTICLE	COST	RANK
Watershed Management	Structural Non-Structural	Very Very	Unknown Unknown	10 10
Biological Control	Grass Carp Leaf Beatle	No No		0 0
Cultural Control	Aeration Light Limitations Benthic Barriers Draw Down Hand Harvesting Sediment Removal	Very Potential Not Practical Not Practical Not Practical Not Practical	Implemented +$3,000.00 +$4,000.00 +$1,000.00 Unknown Unknown	6 6 5 5 1 1
Mechanical Control	Diver Dredging Harvesting Emergent Cutting	Not Practical Not Practical Not Required	$100.00 sq/ft $1,800.00 A $22,000.00 A	3 8 0
Herbicides/ Algaecides	Various	Recommended	$2,100.00 $2,100.00	10 10

FACTORS INFLUENCING THE DECISION TO USE AQUATIC HERBICIDES, AND OR ALGAECIDES

A Plant Density Ranking Scale was developed to support the development of control tolerances for the lake systems. The decision to implement aquatic vegetation control treatments is based on the plant's growth stage as well as its potential to impact the beneficial uses of a specific area. If systemic herbicides are used to control submerged vegetation, control measures will be implemented when the plants are young (approximately 6-12 inches), so that they can be controlled prior to developing into nuisance growths, and thus having negative impacts on the beneficial uses of the systems. When aquatic vegetation is treated with systemic herbicides in an early growth stage, there is less plant biomass that is controlled and thus decomposing in the system, and this helps reduce and protect against impacts to dissolved oxygen depletion from decomposing biomass. If contact herbicides are used to control aquatic vegetation, treatments will be made based on the Plant Density Scale as outline above, and treatments will be timed to reduce plant growth prior to them reaching nuisance proportions, and thus impacting the beneficial uses of the systems. Any filamentous and planktonic algae treatments that may be required in the future will be made based on visual observation, algae count through Chlorophyll a sampling, or other algae density measures that may be in use through laboratory analysis, and treatments will be timed to reduce algae growth prior to it reaching nuisance proportions, and thus impacting the beneficial uses of the systems.

CHAPTER 4

AQUATIC PESTICIDES/ADJUVANTS

ACTIVE INGREDIENTS

Below are brief descriptions of the active ingredients covered by the General Permit. The

- **2,4-D:** Applications of 2,4-D based aquatic pesticides are used to control broad-leafed aquatic weeds, as well as water hyacinth. It is applied using a spray nozzle.
  The California Department of Health Services (DHS) and USEPA have promulgated a Primary Maximum Contaminant Level (MCL) of 70 **ug**/L for 2,4-D that is applicable for drinking water sources, or water bodies with a domestic or municipal supply (MUN) designation. This General Permit requires compliance with the Primary MCL for discharges to water bodies with MUN designation is 70 ug/L.
- **Copper:** Copper-based aquatic pesticides are used to control algae and aquatic plant growth. There are many different formulations, and application methods vary from pitching water-soluble tablets to direct injection of copper-based liquid products. Copper-based aquatic pesticide labels recommend applications of copper up to 1,300 ug/L or more. Applicable water quality criteria for fresh and salt water, discussed below, are less than 1,300 ug/L. Limitations are required for discharges that have the Reasonable Potential to cause an exceedance of applicable criteria or WQOs. Copper is a priority pollutant and the criteria for dissolved copper are specified in Table (b)(1) of the CTR. Criteria are established for maximum and continuous discharges in fresh and salt water. Conversion factors were also used to convert dissolved copper limitations to the total copper limitations assigned in the General Permit. The continuous or chronic criterion has been chosen in this case because it is the most protective considering that in many cases aquatic pesticides are applied several times per season and the limitations is for pesticide residue in receiving waters. Freshwater copper criteria need to be adjusted for water hardness and may significantly differ from one system to another. Water hardness must be determined by the calculation or titration method. It is necessary to specify a range of total copper limitations in the General Permit because of the possible variations in freshwater hardness statewide. The total copper limitation must be calculated using the following equation: Max Residual Total Copper Conc. (ug/L) = exp (0.8545(in (hardness, mg/L as CaCO3))-1.702). For example, for application in water with a hardness of 325 mg/L, to be in compliance with this General Permit, the copper concentration in the receiving water must be less than 26 ug/L.
- **Diquat:** Diquat-based aquatic pesticides are used to control aquatic weeds. Diquat is a quick-acting contact pesticide, causing injury only to the parts of

the plant to which it is applied. All Regional Board Basin Plans contain narrative criteria prohibiting discharges from causing toxicity in receiving waters. USEPA has established an MCL of 20 ug/L for diquat that is applicable for drinking water sources or water bodies with an MUN designation. Therefore, to prevent receiving waters with an MUN designation from toxicity due to the use of diquat-based aquatic pesticides, the General Permit requires compliance with USEPA's MCL of 20 ug/L. The receiving water limitation for discharges of diquat to water bodies with MUN designation is 20 ug/L.

- **Endothall:** Endothall-based aquatic pesticides are used to control a variety of aquatic weeds. USEPA has promulgated a Primary MCL of 100 ug/L for endothall that is applicable for drinking water sources or water bodies with an MUN designation. This General Permit requires compliance with USEPA Primary MCLs for discharges to water bodies with MUN designation. Therefore, the receiving water limitation for discharge of endothall to water bodies with MUN designation is 100 ug/L.
- **Flumioxazin:** Flumioxazin is an N-phenylphthalimide herbicide used to control selected grass and broadleaf weeds. Flumioxazin is a light-dependent peroxidizing herbicide (LDPH), which acts by blocking heme and chlorophyll biosynthesis resulting in the accumulation of photo-toxic porphyrins.
- **Fluridone:** Fluridone is a systemic herbicide that kills the entire plant and is generally non-selective, which means most submersed plants and some floating leaved plants will be killed by fluridone during the treatment. USEPA has a reference does as a drinking water level of 560 ug/L. This General Permit requires compliance with USEPA's reference dose of 560 ug/L for discharges to water bodies with MUN designation. Therefore, the receiving water limitations for discharge of fluridone to water bodies with MUN designation is 560 ug/L.
- **Glyphosate:** Glyphosate-based aquatic pesticides are used to control emergent foliage of aquatic weeds. Glyphosate-based aquatic pesticides are ineffective on submerged or mostly submerged foliage. USEPA has promulgated a Primary MCL of 700 ug/L for glyphosate that is applicable for drinking water sources or water bodies with an MUN designation. This General Permit requires compliance with USEPA Primary MCLs for discharges to water bodies with MUN designation. Therefore, the receiving water limitation for discharge of glyphosate to water bodies with MUN designation is 700 ug/L.
- **Imazapyr:** Imazapyr is a non-selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses and broadleaved herbs, woody species, riparian and emergent aquatic species. It is used to eliminate Lithocarpus densiflorus (Tan Oak) and Arbutus menziesii (Pacific Madrone). Additionally, Imazapyr is used to control annual and perennial grass and broadleaved weeds, brush, vines and many deciduous trees. Imazapyr is absorbed by the leaves and roots and moves rapidly through the plant. It accumulates in the meristem region (active growth region) of the

plant. In plants, Imazapyr disrupts protein synthesis and interferes with cell growth and DNA synthesis.

- **Nonylphenol:** Nonylphenol is soluble in water and moderately resistant to natural degradation in water. Because of its chemical properties and widespread use as a chemical intermediate (surfactant), concerns have been raised over the risks it poses to both freshwater and saltwater organisms. USEPA has recommended a current freshwater application rate of 6.6 ug/L, but has not promulgated a primary MCL.
- **Penoxsulam:** Penoxsulam is an acetolactate synthase inhibitor herbicide developed in the mid-2000s. This substance is designed to control existing broadleaf weeds and similar plants in lawns, rice fields and cereal crops. While penoxsulam is not effective against most grass species, it is capable of killing several pest grasses that prefer wet environments.
- **Triclopyr:** Triclopyr is an herbicide used for the control of perennial broadleaf weeds. Triclopyr has little tendency to hydrolyze, and photolysis is the main degradation pathway in natural water. In river water, the half-life of triclopyr was determined to be 1.3 days in artificial and natural light. Currently, there are no state or USEPA based numeric objectives or criteria for triclopyr. However, this General Permit requires discharges who use triclopyr to monitor their applications.

AVAILABLE FOR USE AND APPLICATION METHODS

The aquatic herbicides and algaecides that are available for use and their water use restrictions are outlined in Table 1 above. Sonar and Reward are available to control the invasive submerged aquatic plant Eurasian Watermilfoil. Sonar and Reward are available for the control of Azolla, and glyphosate or imazapyr are available to control emergent vegetation based on their species present. In the event algae control becomes a requirement, control will be obtained primarily through the use of an approved chelated copper cannot be met. Aquathol K and or Reward maybe used for the control of other submerged vegetation if problems develop in systems outlined above.

Aquatic herbicide and algaecide applications will be performed utilizing Best Management Practices by licensed personnel in accordance with Pest Control Recommendations issued by a State of California, Department of Pesticide Regulation (DPR) Pest Control Advisor. Applications will be performed from a boat that is specifically designed with a pumping and metering system for aquatic herbicide and/ or algaecide applications, and or applications will be made from shore in areas where the use of a boat are not practical.

APPLICATION AREAS

Aquatic herbicide applications will be limited to the areas of the lake systems where aquatic vegetation growths impact the beneficial uses of the systems.

AQUATIC VEGETATION CONTROL ALTERNATIVES

All appropriate aquatic plant management technologies within the context of the identified beneficial uses and impacted areas of the systems have been evaluated, and include all available cultural, biological, mechanical, and aquatic herbicide/ algaecide formulations. The alternatives are outlined above.

AQUATIC HERBICIDE AND ALGAECIDE APPLICATION RATES

Aquatic herbicide and algaecide treatments will be determined based on the following site characteristics:

- The surface area and volume of the treatment area will be determined for each application.
- The areas targeted for aquatic vegetation control will be determined prior to each application.
- The water volume of the treatment area will be calculated and determined for each application.
- Water movement through the system includes a potential seasonal flow during the rainy season with daily discharge, and static conditions unless discharges are made from the lake systems during the summer months. Applications will not be performed when there is the potential for discharges from the lake systems in excess of established water quality standards.

ASSESSMENT OF BENEFICIAL AND ADVERSE IMPACTS

The current objectives of the Aquatic Vegetation Management Program are to keep nuisance growths from impacting beneficial uses. The lakes also serve as a catch basin for the watershed. It has been predicted that large mats of aquatic plants like Hydrilla can increase “diurnal fluctuations in dissolved oxygen, Ph, and water temperature which will result in; (a) fish kills, (b) releases of various substances from bottom sediments such as sulfide. . . and (c) precipitation of many nutrients essential for growth of aquatic organisms” (Dechoritz and Lockhart 1995). Nuisance growths of aquatic plants and algae also have an adverse impact on the aesthetic environment while providing a breeding habitat for vectors.

“Beneficial Use” of water has been defined as: “State law defines beneficial uses of California’s waters that may be protected against quality degradation to include (and not be limited to)’. Domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves’ (Water Code Section 13050 (f))” (Central Valley Regional Water Quality Control Board 1998).

CHAPTER 5
MONITORING AND REPORTING PROGRAM

MONITORING REQUIREMENTS

The General Permit requires dischargers to comply with the Monitoring and Reporting Programs (MRP) outlined in the General Permit's. The goals of the MRP are to:

- Determine compliance with the receiving water limitations and other requirements specified in this General permit;
- Measure and improve the effectiveness of the APAP;
- Support the development, implementation, and effectiveness of BMPs;
- Assess the chemical, physical, and biological impacts on receiving waters resulting from aquatic pesticide applications;
- Assess the overall health and evaluate long-term trends in receiving water quality;
- weed management projects are equivalent to pre-application conditions;
- Identify and characterize aquatic pesticide application projects conducted by the discharger; and
- Ensure that projects that are monitored are representative of all pesticides and application methods used by the discharger.

Sample Analysis

All samples requiring laboratory analyses must be conducted at a laboratory certified for such analyses by the California Department of Health Services. All analyses are to 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) (Title 40 code of Federal Regulations part 136), except nonylphenol analysis. Nonylphenol is analyzed using USEPA Method 3535/ Liquid Chromatograph-Fluorescence. Hardness can be determined by the calculation of titration method. Field analysis for the parameters of Temperature, Dissolved Oxygen (DO), and Ph will be performed using a portable Multi-Parameter Meter with a 15-meter probe cable. These meters can measure Ph, ORP, DO, conductivity, TDS, salinity and temperature. Secchi Disk measurements will be performed using a standard Secchi disk.

When samples are collected, a chain of custody form will be completed, and the samples will be delivered to a State of California Certified Laboratory for analysis per the NPDES Permit's requirements.

Sampling Procedures

Samples will be collected using sampling procedures, which minimize loss of monitored constituents during sample collection and analysis and maintain sample integrity.

Sampling Protocols
Samples will be retrieved, stored, recorded, and shipped to a third-party laboratory as outlined above using the following methods and precautions. Any deviation from these methods and precautions will be recorded and explained.

Materials for sampling
In field:
- New sampling bottles, one per sample
- Cooler(s) sufficient to hold bottles, with ice or gel packs
- Plastic Gloves
- Subsurface grab sampler
- Depth finder or marked pole
- Instrument(s) for temperature, Ph, Dissolved oxygen, hardness
- Field data sheets, three-ring binder, and clipboard
- Sheet with sample number tags
- A clean boat and a transport vehicle

In office:
- Refrigerator

Precautions to be taken to prevent contamination of the sample:
- Wearing of disposable plastic gloves while taking the sample
- Wearing of clean, freshly laundered clothing
- All materials used for sample collection shall be kept far from herbicide storage areas.
  This includes sample bottles, gloves, coolers, and the refrigerator
- Pre-Treatment samples shall be stored in a different cooler from treated samples

Method to take a single sample: The samples will be simple grab samples
- When approaching a sampling location, care will be taken to not stir up sediments
- When taking the sample, the cap will be left on the bottle until it is at the depth appropriate for the type of pesticide and water body, as outlined above. A grab sampler extension will be used if necessary. If sampling depth is beyond reach of the grab sampler, the sample will be taken as deep as possible
- Once the bottle is at the appropriate depth, the cap will be removed below the surface stirring of the sediments will be avoided
- The bottle will be rinsed with sample water and emptied twice, then filled completely
- Once the bottle is full, it will be capped
- The bottle will be dried, and a sample number tag attached to the bottle and the sample data sheet

- The bottle will be placed in the appropriate cooler. The bottles will be kept in contact with ice packs
- Other water condition measurements will be taken
- The Water Sampling Data Sheet will be filled out with information for the sample
- In the office, the bottle will be placed into a refrigerator

Special Notes
For a spot treatment, a sketch map will be made showing the site of the treatment and the location of the sample relative to the treated area.

Submitting Samples to lab
- Samples will be submitted within 48 hours of taking sample(s)
- Samples will be packed in a cooler with ice packs between each bottle
- Chain of Custody (COC) form will be filled out, being sure to note the sample numbers that are submitted in the shipment.

If the samples are shipped to the lab, the pick-up person will sign the COC and a copy will be made before sending out the shipment. If the samples are delivered to the lab, the delivering person will have receiving person sign the COC form and make a copy before turning over the shipment.

QUALITY SPECIFICATIONS FOR WATER SAMPLES

Water samples for determination of aquatic herbicide residues will be retrieved according to the Water Monitoring Plan. All data will be determined as accurately as possible using the instruments described below. Data readings within the tolerances established below will be considered acceptable. Deviations from these tolerances must be recorded and explained.

Tolerances
- For location, +/- one meter for land-based sampling and +/- five meters for water-based sampling.
- For depth, +/- one meter
- For times specified in the Water Monitoring Plan in hours, +/- 0.5 hours
- For times specified in the Water Monitoring Plan in days, +/- one day if 14 days or less after application/ treatment, and +/- two days for more than 14 days after application/treatment
- Locations will be verified by GPS within +/- five meters or the precision of the system; whichever is less at the time of sampling
- Depths will be verified with meter sticks or long poles marked every 0.5 meters, or by a depth

- Timings will be verified by using quartz clocks synchronized once a month with the United States Navy Observatory or GPS
- All locations, depths, and timings will be recorded on appropriate forms. Any deviations will be recorded and explained.

Retention of Records

Records of all monitoring information including all calibration and maintenance records, copies of all reports required by the General Permit's, and records of all data used to complete the application for the General Permit's will be retained. Records will be maintained for a minimum of three years from the date of the sampling, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the appropriate Regional Board Executive Officer.

Monitoring Records

Records of monitoring information will include the following:

- The date, exact place, and time of sampling or measurements;
- The individuals who performed the sampling or measurements;
- The date's analyses were performed;
- The individuals who performed the analyses;
- The analytical techniques or method used; and
- The results of such analyses

Device Calibration and Maintenance

All monitoring instruments and devices that are used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy.

RECEIVING WATER MONITORING

Treatment Maps

For each application at each site, a treatment map will be developed with a convenient scale showing the application area, treatment area, immediately adjacent untreated areas (if entire water body is not treated), and water bodies receiving treated water. The information on surface area and/or volume of application area and treatment area and any other information used to calculate dosage and quantity of each pesticide used at each application site will be included with the map data. The sampling locations will be noted on the Treatment Maps along with the global positioning systems (GPS) coordinates for each sampling site.

Control Structure Inspections
Prior to every application, an inspection of the integrity of the discharge valves will be performed to ascertain that treated water does not unintentionally get discharged from the lake system.

Aquatic Pesticide Monitoring Frequency
Samples will be collected at 10% of all application sites for each type of aquatic pesticide used. The 10% sampling sites will be representative sites. The number of representative sites will be rounded to the nearest whole number using scientific number protocol.

Aquatic Pesticide Monitoring
The following monitoring will be performed for each sampling:

- Background Monitoring samples will be collected upstream at the time of the application even, or they will be collected at the treatment area, just prior (up to 24-hours in advance of application) to the application event.
- Event Monitoring samples will be collected immediately downstream 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.
- Post-Event Monitoring samples will be collected within the treatment area and immediately downstream of the treatment area in flowing waters or adjacent to the treatment area in non-flowing waters within one-week after the application event.

Monitoring Parameters
The following parameters will be analyzed:

SAMPLE TYPE	CONSTITUENT/ PARAMETER	SAMPLE METHOD	LABORATORY METHOD	FREQUENCY
Visual	1: Site description (Pond, Lake, open waterway, channel, estimate of percent covered by vegetation, etc.) 2: Appearance of waterway (sheen, color, clarity, etc.) 3: Weather conditions (fog, rain, wind, etc.)	Visual Observation	Not Applicable	All applications at all sites

Physical	1: Temperature3 2: Turbidity-4 3: Electrical conductivity/ salinity4	Grab5	See USEPA Guidelines	All applications at 10 percent of all sites

When field testing for laboratory samples, samples are to be collected at three feet below the surface, or mid-depth if water body is less than six feet deep. Six feet is required when nonylphenol or copper applications are used if water body is six feet or deeper.

REPORTING

All reports will be submitted to the appropriate Regional Board. All reports submitted in response to the Water Quality Order's will comply with the provisions stated in "Standards Provisions and Reporting for Waste Discharge Requirements (NPDES)" (Attachment D), Section B, Monitoring and information:

- An Executive Summary discussing General Permit compliance or violation and the effectiveness of the APAP to reduce or prevent the discharge or pollutants associated with aquatic pesticide applications.
- A summary of monitoring data, including the identification of water quality improvements or degradation, and recommendations for improvements to the APAP (including proposed BMPs) based on the monitoring results. All receiving water monitoring data shall be compared to applicable water quality standards.
- Identification of BMPs and a discussion of their effectiveness in meeting this General Permit requirements.
- A discussion of BMP modifications addressing violations of this General Permit.
- A map showing the location of each application and treatment area.
- Types and amounts of aquatic pesticides used at each application event during each application.
- Information on surface area and/or volume of the treatment areas and any other information used to calculate dosage and quantity of each pesticide used.
- List of gates in the treatment area that may discharge to surface waters; time of gate closure and reopening, include any calculations used to determine closure and reopening times, if applicable.
- Sampling results for all required monitoring under the General Permits MRP and any additional sampling conducted in compliance with section A.3 of the General Permit's MRP. Sampling results will indicate the name of the sampling agency or organization, detailed sampling location information (including latitude and longitude or township/range/section if available), detailed map or description of each sampling site (i.e., address, crossroads, etc.), collection date, name of constituent/parameter and its concentration detected, minimum

levels, method detection limits for each constituent analysis, name or description of water body sampled, and a comparison with applicable water quality standards, description of analytical QA/quality control plan. Sampling results will be tabulated so that they are readily discernible.

- Recommendations to improve the monitoring program, BMPs, and APAP to ascertain compliance with this General Permit; and
- Proposed changes to the APAP and monitoring program

Data Storage

All data will be recorded on supplied forms. At the end of each day, all data forms will be double copied. The original will stay in specified notebooks. The first copy will be stored in a file cabinet site. The second copy will be stored and shipped with the samples.

Quality Assurance Audits and Personnel

The Water Quality Control Board is welcome to provide third party validation of the sampling procedures.

Quality Control Measures

Each field sampling event will include one Field Blank for each of the herbicide residues being monitored. The Field Blank will be prepared by filling the appropriate number of sample bottles with distilled water at the initiation of the sampling period, capping and labeling the bottles, and keeping them with the other samples collected during the sampling period. At the conclusion of the sampling period (day), the blank samples will accompany other samples to the laboratory for analysis for the active ingredients of the herbicides applied. Laboratory quality control will include adding a matrix spike to each day's set of samples.

Methods for Determination of Other Water Quality Parameters

Water quality parameters such as pH, dissolved oxygen, and temperature will be measured by appropriate instrumentation within the manufacturer's tolerances. These parameters will be measured at the same sites where water samples for aquatic herbicides are retrieved. These parameters will be measured at the same depths from which the water samples for aquatic herbicides are retrieved, within +/- 0.5 meters. Data and deviations will be recorded on specified forms and/or lab notebooks.

Methods for Data Summarization, Analysis, Review, and Reporting

All data will be included in the final report. The final report will also contain narrative and numerical summaries as appropriate. Final data reports will also be reviewed by a Quality Assurance Officer.

Training on Sampling Techniques
All personnel performing water sampling will have been trained before water sampling is scheduled to begin, a training session will be held reviewing sampling technique; equipment and instrument and instrument calibration, maintenance, and operation; sample storage and delivery; and proper use of COC and other forms; and other records and deviations.

GATES AND CONTROL STRUCTURES

The lakes have overflow structures as required by Division of Safety of Dams for emergency release purposes. All overflow structures will be inspected prior to any aquatic pesticide applications to ensure that any water flow from the system will not exceed the Permit limitations. The specific lakes that have gates/control structures are Bridgeway Lakes, Lakeside, Quail Lake, Spanos East, Westlake and Westshore Lake.

BEST MANAGEMENT PRACTICES (BMPs) TO BE IMPLEMENTED

A variety of approaches will be utilized to minimize the impacts of aquatic pesticides used while still achieving their goals.
Techniques that help reduce pesticide impacts include:

- Non-pesticide control methods as outlined above have been reviewed, and will be implemented based on efficiencies.
- Pre-Treatment Surveys will be carried out to identify potential treatment areas and timing
- Adjustments will be made to treatment protocols based upon day of treatment survey results
- Choice of pesticides based on toxicity
- All attempts will be made to time treatments when no water is being discharged from the lake system
- Aquatic Pesticide use rates are limited to ensure compliance with Receiving Water Limitations

From among the few alternative aquatic herbicides available, the most effective and safest options have been selected for use in this program. Herbicide application personnel know the strengths and weaknesses of the various available options, and take them into consideration when choosing a treatment protocol for a specific site.

In order to avoid inadvertent or accidental soil or water contamination with aquatic herbicides, application personnel follow the storage, transport, and spill control procedures recommended by the CDPR and the USEPA.

Over applications are avoided by following the specific product labels for the aquatic pesticides used in the program. Application equipment is routinely cleaned and

calibrated, and all label directions and DPR guidelines are followed as to acceptable application weather conditions. Applications are not made in winds above 10 miles per hour.

The various BMPs being implemented ensures that the Aquatic Vegetation Management Program will meet the requirements of the NPDES permit.

Fish Kill Prevention

- Take dissolved oxygen reading prior to whole lake algae or vegetation treatments to ensure adequate levels to support the habitat.
- Always try to perform spot treatments, instead of whole lake treatments, in order to avoid ecological hypoxia (oxygen depletion), which is the most common cause of fish kills.
- Maintain lake to reduce eutrophication, which can also lead to oxygen depletion.
- Select appropriate pesticides that are not harmful to fish.
- Encourage rooted native aquatic plants to support fish habitat.

Licensing

All crew leaders and biologists that apply or supervise the application of aquatic pesticides will be Certified or Licensed by the DPR.

Notification

Whenever pesticides are used that might lead to damage to irrigated crops (the most severe potential impact on beneficial uses caused by the Program), potentially affected users in the area will be informed of the treatments and of means to avoid damage.

Site Evaluations

Both preliminary and secondary site evaluations will be a major aspect of the Program.

Alternative Treatments

The IAVMP considers a number of potential alternative control strategies, and alternate non-herbicide options will be implemented when conditions are suitable.

Treatment Conditions

Every application will be made according to label directions and other requirements as directed by DPR or the agricultural commissioner, which not only specify the amounts and situations where pesticides may be applied, but the atmospheric and environmental conditions under which they may be applied. If there are conditions

where it is determined that the treatment would be ineffective, application staff will wait for other conditions or use a different treatment method.

Post-Treatment
Surveys will also be carried out for post-treatment assessment of treatment efficacy and non-target impacts. Survey crews will be instructed to look for possible non-target impacts that can be seen with the naked eye that would include damage to plants on the shoreline.

- The applicator will follow all pesticide label instructions and any Use Permits issued by a CAC.
- The applicator will be licensed by DPR or work under the supervision of someone who is licensed if the aquatic pesticide is considered a restricted material;
- The discharger will comply with effluent limitations
- The discharger will implement and follow this Aquatic Pesticide Application Plan (APAP);
- The discharger will comply with applicable receiving water limitations; and
- The discharger will comply with the monitoring and reporting requirements.

RECEIVING WATER LIMITATIONS

No treatments will be made to the system if any potential exists to cause or contribute to an exceedance of the following receiving water limitations.

Effluent Limitations

Constituent/ Parameter	BENEFICIAL USE			
	MUN	WARM or COLD	Other than MUN, WARM, or COLD	All Designations
2,4-D	70 ug/L			
Acrolein7	320 ug/L	21 ug/L	780 ug/L	
Copper8				Maximum Copper Concentration= exp(0.8545 (ln(hardness))-1.702)
Diquat	20 ug/L			
Endothall	100 ug/L			

Fluridone	560 ug/L			
Glyphosate	700 ug/L			
Toxicity				Applications shall not cause or contribute to toxicity

- The discharge of wastes other than as described in this General Permit is prohibited, unless authorized by a separate NPDES permit.
- The discharge of wastes shall not cause or contribute to conditions of nuisance or pollution.
- The discharge shall not cause or contribute to long-term adverse impacts on beneficial uses of waters of the United States.
- The discharger shall apply pesticides in accordance with this APAP

Aquatic Pesticide Use Requirements

- **License Requirements**
  - Dischargers must be licensed by DPR if such licensing is required for the aquatic pesticide application project.
- **Application Requirements**
  - The pesticide use must be consistent with FIFRA pesticide label instructions and any Use Permits issued by CACs.

- **Application Schedule**
  - When requested, the discharger shall provide a phone number to persons who request the discharger's application schedule. The discharger shall provide the requester with the most current application schedule and inform the requester if the schedule is subject to change. Information may be made available by electronic means.
- **Public Notice Requirements**
  - Every calendar year, prior to the first application of aquatic pesticides, the discharger shall notify potentially affected governmental agencies. The notification includes the following information:
    a. A statement of the discharger's intent to apply aquatic pesticide(s);
    b. Name of pesticide(s);
    c. Purpose of use;
    d. General time period and locations of expected use;
    e. Any water use restrictions or precautions during treatment; and
    f. A phone number that interested persons may call to obtain additional information from the discharger
- **Pesticide Application Log**

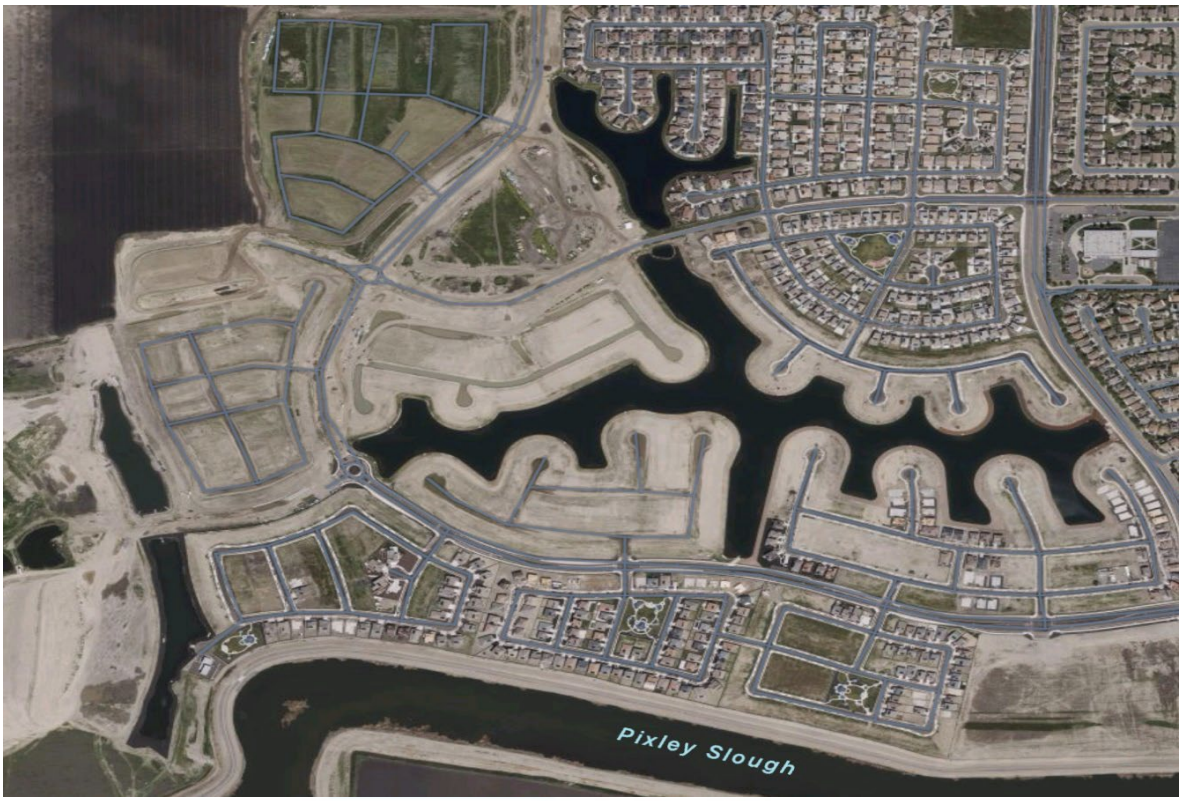
- The discharger shall maintain a log for each aquatic pesticide application. The application log shall contain, at a minimum, the following information:
    a. Date of application;
    b. Location of application;
    c. Name of applicator;
    d. List of gates or control structures in the treatment area that may discharge to surface waters, if applicable;
    e. Time of gate or control structure closure and reopening, include any calculations used to determine closure and reopening times, if applicable;
    f. Application details, such as water temperature, flow or level of water body, time application started and stopped, and aquatic pesticide application rate and concentration;
    g. Visual monitoring assessment; and
    h. Certification that applicator(s) followed the APAP.

WASTE DISCHARGE REQUIREMENTS

Discharges shall not cause or contribute to an exceedance of any CTR criteria or applicable water quality objective in a State or Regional Board Water Quality Control Plan in the receiving water. No assessable adverse impacts are expected from the use of the aquatic pesticides in the Aquatic Vegetation Control Program.

Westlake Villages

Westlake Villages-Stockton



WESTLAKE VILLAGES LAKES
The lakes are located in the Central valley of San Joaquin County off Interstate 5 & Eight Mile Rd in Stockton, CA; within a development of residential housing.

The lakes are fed by storm water and residential runoff. The main supply of water is provided by a siphon line connected to the Pixley Slough adjacent to the community. Nuisance growths of submersed aquatic vegetation have impacted the beneficial uses of the system that include water storage and aesthetics. Historical methods that have been utilized for the control of aquatic vegetation include the use of United States Environmental Protection Agency (US-EPA) Herbicides and Algaecides, as well as aeration systems.

The manmade lakes will serve a critical function as one of the key elements as part of the stormwater infrastructure system. The major functions and objectives of the manmade lakes includes: (1) stormwater conveyance from one end of the project to the pump station intake, (2) stormwater peak attenuation and temporary storage that reduces pumping capacity requirements as compared to installing a peak flow pump station, (3) stormwater quality treatment through application of multiple layers of natural treatment elements, and (4) reuse of residential development dry-weather and nuisance flows. Application of a large-scale manmade lakes system within residential development offers an innovative and effective approach to address water quality treatment rather than relying on conventional structural BMPs that have only limited pollutant removal effectiveness. Additional advantages of the lake system include: (1) continuous year-round treatment process with the permanent water body, (2) enhanced rates of treatment, (3) better integration with the land use plan, (4) reduced infrastructure costs, (5) community landscape and aesthetic appeal, (6) natural ecosystem benefits, and (7) recreational benefits to the community.

LAKE 1

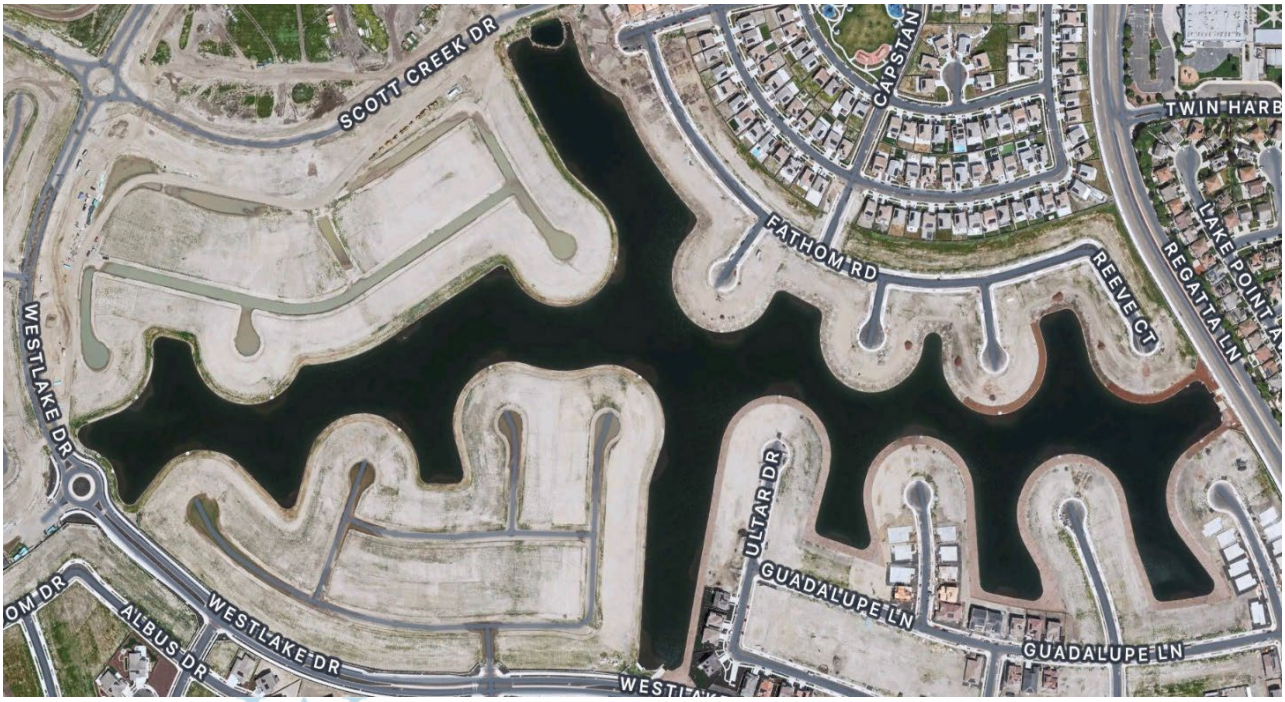
The lake has a surface area of approximately 7.71 acres, and an average depth of approximately 8 feet. Lake 1 overflows into Lake 2 via a 12” waterfall drop on the south side of Scott Creek Drive.

Lake 1 includes a multi-purpose pump station which includes:

- Circulation pump skid: Intake in lake 2 pulls water to pump station & is discharged in lake 1 & 2 for flow to mitigate algae growth and nuisance smells.
- Irrigation pump: The lake system is used for irrigating common area throughout the community.
- Chlorine injection pump: ONLY used for injection of chlorine after irrigation pump discharge to common area. Chlorine is injected in low doses to remove algae and other aquatic organisms that may clog irrigation systems.
- Aluminum sulfate injection: Aluminum sulfate 48%-50% NSF injected back into lake system via injection pumps to circulation system to remove high levels of phosphates within water body. This reduces clogging in the irrigation system, removes food source for algae growth and other nuisance organisms, increases clarity through water column, and ultimately added health to the lake system.
- Dye injection system: Non-toxic black pond dye is injected into lake system via injection pumps to circulation system to mitigate sunlight and UV penetration. This ultimately mitigates photosynthesis within the water column and helps to prevent algae growth, unwanted smells, and lessening usage of aquatic pesticides.
- Blower Diffused Aeration system: This VFD driven compressor system provides continuous flow of air to the bottom of the lake system in lakes 1 & 2. This provides dissolved oxygen to the water column which also helps to mitigate algae blooms, and destratification of thermal layers (temperature) build up in the water column. This can help prevent evaporation while keeping the lake temperature cooler during the summer months.

LAKE 2

The lake has a surface area of approximately 39.5 acres, and an average depth of approximately 10.5 feet. Lake 2 overflows into lake 3. Near the boat ramp on Regatta Lanen is the receiving water from the siphon line allowing incoming water from Pixey Slough. Majority of the nuisance vegetation enters the lake system from this siphon line.

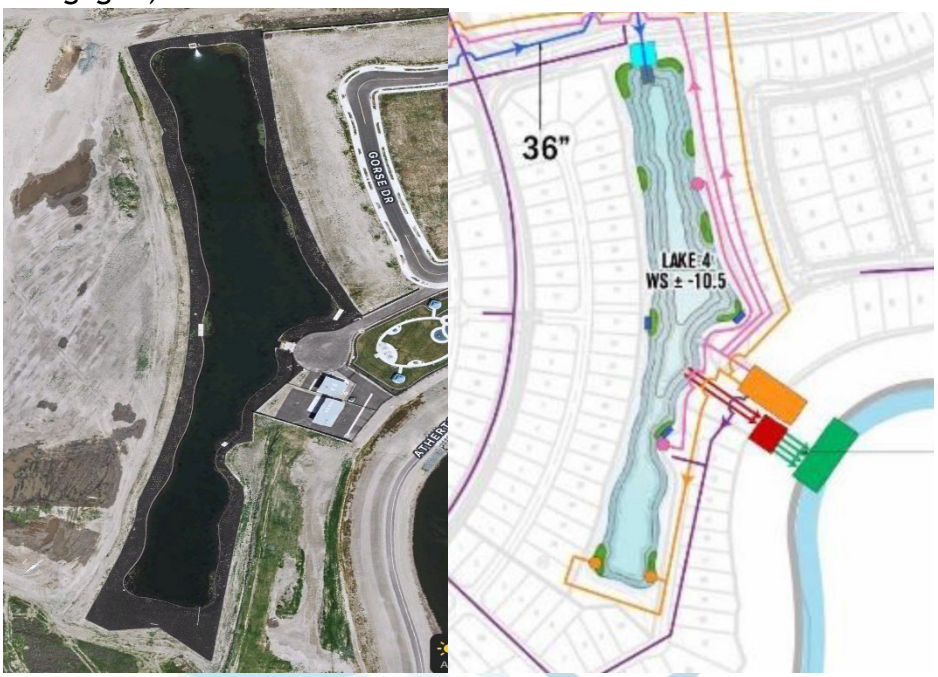


LAKE 3

The lake has a surface area of approximately 4.95 acres, and an average depth of approximately 10.5 feet. Lake 3 overflows into lake 4.

LAKE 4

The lake has a surface area of approximately 5.27 acres, and an average depth of approximately 10.5 feet. Lake 4 has a pump station managed by the City of Stockton for discharging water back to Pixey Slough via lift pumps in high water situations (float switch engaged).



Lake 4 includes a multi-purpose pump station which includes:

- Circulation pump skid: Intake in lake 4 pulls water to pump station & is discharged in lake 3 & 4 for flow to mitigate algae growth and nuisance smells.
- Irrigation pump: The lake system is used for irrigating common areas throughout the community.
- Chlorine injection pump: ONLY used for injection of chlorine after irrigation pump discharge to common area. Chlorine is injected in low doses to remove algae and other aquatic organisms that may clog irrigation systems.
- Aluminum sulfate injection: Aluminum sulfate 48%-50% NSF injected back into lake system via injection pumps to circulation system to remove high levels of phosphates within water body. This reduces clogging in the irrigation system, removes food source for algae growth and other nuisance organisms, increases clarity through water column, and ultimately added health to the lake system.
- Dye injection system: Non-toxic black pond dye is injected into lake system via injection pumps to circulation system to mitigate sunlight and UV penetration. This ultimately mitigates photosynthesis within the water column and helps to prevent algae growth, unwanted smells, and lessening usage of aquatic pesticides.
- Blower Diffused Aeration system: This VFD driven compressor system provides continuous flow of air to the bottom of the lake system in lakes 3 & 4. This provides dissolved oxygen to the water column which also helps to mitigate algae blooms, and destratification of thermal layers (temperature) build up in the water column. This can help prevent evaporation while keeping the lake temperature cooler during the summer months.
- Toe Drain recirculation: There is an underground drainage system (French drain) collecting water leaching via the levy that supports Pixey slough. This water enters the pump station via that drainage system and is pumped back into the lake system for redistribution and anti-flooding precautions. This water is high in phosphates and nitrates due to its leaching of underground water. This is a main contributor to the need for aquatic pesticides and aluminum sulfate flocculation.

CHARACTERIZATION OF TREATMENT PROJECT

Nuisance growths of aquatic vegetation within Westlake Villages Lakes have caused varying levels of negative impacts on the beneficial uses of these water bodies for the populace as well as maintenance personnel in recent years. To ensure that nuisance growths of aquatic vegetation do not impact the beneficial uses of these water bodies in the future years, this Aquatic Pesticide Application Plan (APAP) was developed by Waterworks Aquatic Management, Inc.

Waterworks Aquatic Management, Inc. staff have performed various site inspections of Westlake Villages-Stockton to review the various issues associated with nuisance growths of aquatic vegetation. These site inspections provided the information contained herein.

AQUATIC VEGETATION IMPACTS TO THE LAKE SYSTEM

A review of the Aquatic Vegetation impacts on Westlake Villages-Stockton Lakes is presented below. Westlake Villages-Stockton Lakes have been highly impacted due to the presence of the aquatic plants listed below. The lakes are impacted by nuisance algae growth during the warmer months. Although these lakes have specific algae and vegetation that have been identified below, we want to be comprehensive in specifying that there are a number of varieties and species of algae, submersed vegetation, floating, and terrestrial vegetation that can vary from year-to-year, Chapter 2 contains a more comprehensive list of algae and vegetation that can be found in these lakes at any given time.

Problem Identification (Species Present)

- Attached, Planktonic and Filamentous Algae
- Planktonic Algae
- Duckweed (Lemna spp.)
- Mosquito Fern (Azolla spp.)
- Coontail (Ceratophyllum demersum L.)
- Sago Pondweed (Stuckenia Pectinatus (L.) Boerner)
- American Pondweed (Potamogeton nodosuspoir)
- Curly-Leaf Pondweed (Potamogeton crispus)
- Watermilfoil (Myriophyllum spicatum spp.)
- Hydrilla/Brazilian Elodea (Hydrilla verticillata spp and Egeria densa spp.)
- Parrot Feather (Myriophyllum aquaticum spp.)
- Water Hyacinth (Eichhornia crassipes spp.)
- Yellow Water Lily (Nuphar lutea spp.)
- Cattails (Typha spp.)
- Eurasian Milfoil (Myriophyllum spicatum)
- Creeping water-primrose (Ludwigia peploides spp.)

Activities Being Impacted

The main impacts to the beneficial uses associated with nuisance growths of aquatic vegetation within the Westlake Villages-Stockton Lakes are related primarily to Irrigation usages, storm water detention and aesthetics. Negative impacts to the aquatic ecosystem will continue or increase if the aquatic weeds and algae are left uncontrolled.

Problem Investigation

Potential cause(s) of nuisance aquatic vegetation problems within the systems outlined above are believed to be primarily related to nutrient loading and species introduction.

Management Goals Assessment

Westlake Villages-Stockton Lakes are being managed for water storage (flood control) as well as for aesthetics. The management goals are thus to control the noxious weeds and to control the other aquatic vegetation species that have an impact on the beneficial uses of the systems as outlined above.

INTEGRATED AQUATIC VEGETATION CONTROL RECOMMENDATIONS

The recommended control strategy includes establishment of treatment thresholds, monitoring protocols to determine if thresholds are exceeded, and protocols to implement control measures when thresholds are exceeded in compliance with Best Management Practices (BMP's). The control recommendations to deal with exotic and nuisance aquatic vegetation growth present within the systems have been determined based on survey results, and recommended schedules for aquatic vegetation control are outlined in the APAP.

- It is recommended that the aforementioned aquatic vegetation found growing in these lakes are to be monitored and treated "as needed" as spot treatment applications to insure control.

CONTROL TOLERANCES

Treatments for the control of aquatic vegetation using contact herbicides will be implemented each year when plant densities begin to reach nuisance levels. Treatments for the control of aquatic vegetation using a systemic & Contact aquatic herbicide will be implemented each year when the plants begin to grow. Treatments for the control of algae will be implemented when, or just prior to densities reaching nuisance levels based on visual observations or when ambient temperatures reach 65+ degrees (F) for efficacy.

APPLICATION AREAS

Aquatic herbicide applications will be limited to the areas of the lake systems where aquatic vegetation growths impact the beneficial uses of the systems. Specific area would include:

- **Suction intake locations for pump station irrigation.**
- **Lake circulation pump discharge locations**
- **Sequestered planter box locations to mitigate nuisance growth of unwanted aquatic vegetation.**
- **lake fill discharge entrance for water siphon supply line**
- **All locations within lake system to mitigate nuisance growth, clogging of pumps, or discharge back to Pixley slough.**

VICINITY MAP

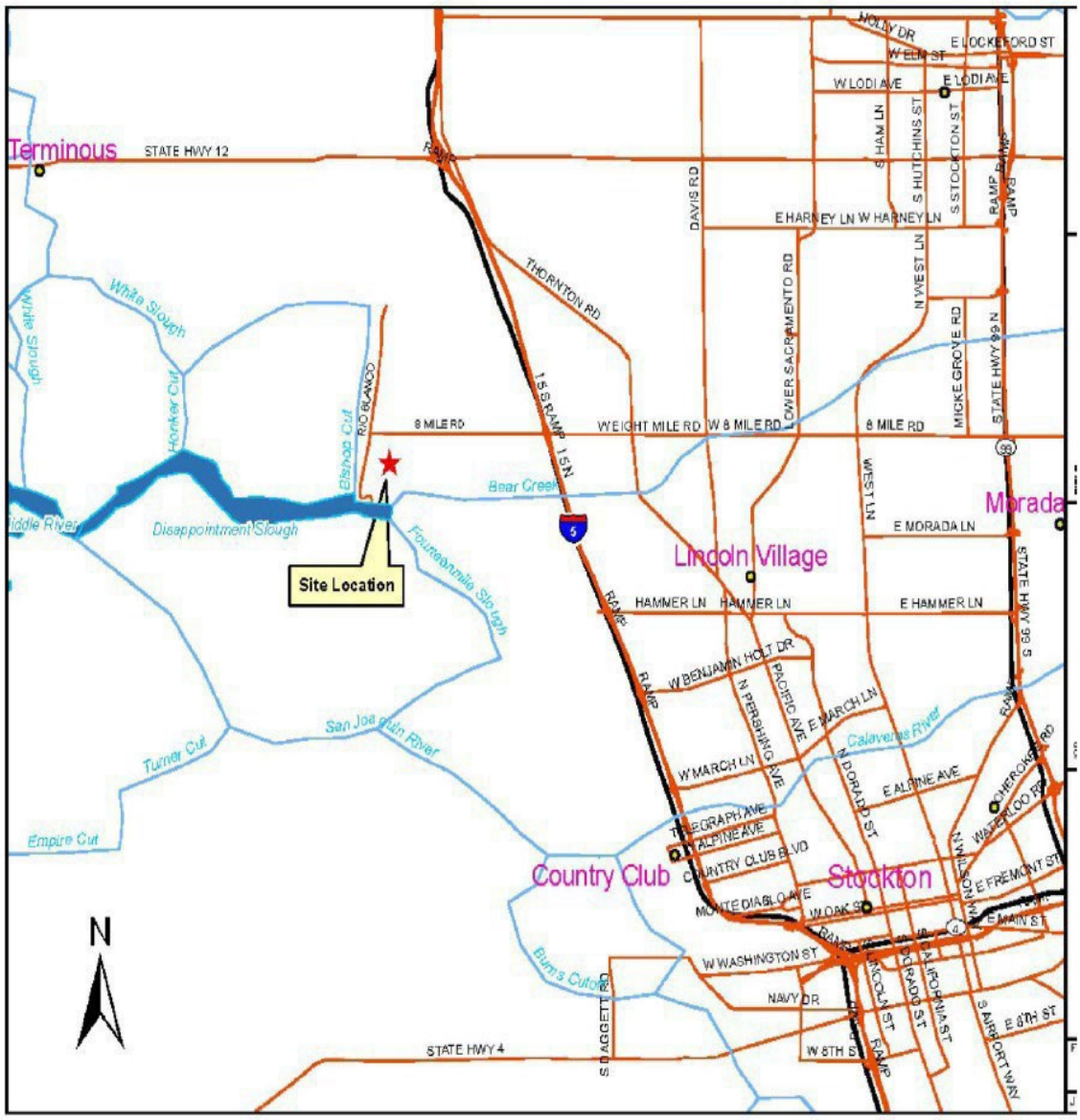


Figure 1-1: Regional Vicinity Map Illustrating Westlake Development Project Location

APPENDIX

APAP UPDATES

This APAP will be updated as the General Permit conditions change, and or as new control technologies are developed and become available.

NPDES GENERAL PERMIT COMPLIANCE

This Integrated Aquatic Vegetation Management Plan was developed in part to ensure compliance with Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States, General Permit No. CAG990005 (NPDES Permit) that was adopted by the State Water Resource Control Board on May 20, 2004. Compliance with this NPDES Permit is required for the use of aquatic herbicides and or algaecides to any water body in California that is hydro logically connected to waters of the United States (The Westlake Villages-Stockton Lakes fit into this category as they drain to water of the U.S.). The following items have been, or will be completed per the General Permit requirements:

- A Notice of Intent (NOI) for the NPDES Permit for the Discharge of Aquatic Pesticides to Waters of the United States will be filed with the California Regional Water Quality Control Board (Region 1) prior to any pesticide treatments.
- Best Management Practices (BMP) for all aquatic herbicide and algaecide treatments have been developed and are outlined in this plan.
- A water Quality Monitoring Program and Quality Assurance Project Plan for the Association's Aquatic Vegetation Control Program has been developed and is outlined in this APAP.
- This Aquatic Pesticide Application plan (APAP) will be submitted to the Regional Water Quality Control Board as required under the General Permit conditions.

REFERENCES

The following is a list of references where data, graphs, and or pictures were derived from:

- Dechoritz, N. and M. Lockhart 1995, Action Plan for Hydrilla Eradication in Lake County, California Department of Food and Agriculture, 1220 "N" Street, Sacramento, California.
- Water Monitoring Plan for the California Department of Food and Agriculture Hydrilla Eradication Program
- Aquatic and Riparian Weeds of the West, DiTamaso and Healy, 2003
- Aquatic Plant Control Research Program (APCRP)
  U.S. Army Engineer Research and Development Center
  Waterways Experiment Station Vicksburg, MS 39180-6199
- U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL

- Applied Biochemists, Inc.'s "Water Weed & Algae" Book
- University of Florida, Center for Aquatic and Invasive Plants, File Photo's
- Rhea L. Williamson PhD, San Jose State University
- California Lake Management Society (CALMS Spring Seminar Series)
- Minnesota Lakes Association (http://mnlakes.org/main_dev/news/uniquechallenge.cfm)
- Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed control in Waters of the Unites States, General Permit No. CAG990005
- Brooks, R.E. and L. A. Hauser. 1978. Aquatic vascular plants of Kansas I. Submersed and floating leaved plants. Technical Publication No. 7 State Biological Survey of Kansas, Lawrence, Kansas
- Stuckey, R.L. 1979. Distributional history of *Potamogeton crispus* (curly pondweed) in North America. Bartonia 46: 22-42.
- Landolt, E. 1986. The family of Lemnaceae- a monographic study. Volume 1. Veroffentlichungen des Geobotanischen Institutes ETH, Stiftung Rubel, Zurich.
- Tarver, D. P., J. A. Rogers, M.J. Mahler, and R.L. Lazor. 1986. Aquatic and wetland Plants of Florida. Third Edition. Florida Department of Natural Resources, Tallahassee, Florida

WATER QUALITY FACT SHEET

Water Quality Order No. 2013-0002-DWQ (attached)