CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2016-0099-01

WASTE DISCHARGE REQUIREMENTS

FOR

UNIVERSITY OF CALIFORNIA, DAVIS
USDA AQUATIC WEED CONTROL LABORATORY,
J. AMOROCHO HYDRAULICS LABORATORY, &
CENTER FOR AQUATIC BIOLOGY AND AQUACULTURE AQUATIC CENTER
YOLO COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Central Valley Water Board) finds that:

1. In November 2013, the University of California, Davis (UCD, hereafter "Discharger") submitted a Report of Waste Discharge (RWD) that describes wastewater production and disposal at the USDA Aquatic Weed Control Laboratory (Aquatic Weed Lab), a University testing and research laboratory. A revised RWD was submitted on 29 May 2015. On 21 July 2015, the Discharger submitted a RWD amendment to include the wastewater production and disposal at the J. Amorocho Hydraulics Laboratory (Hydraulics Lab).

2. Waste Discharge Requirements (WDRs) Order R5-2015-0137 was adopted on 11 December 2015 for the Aquatic Weed Lab and Hydraulics Lab discharge to the South Basin of the Putah Creek North Fork Cutoff (South Basin) and for the Hydraulics Lab construction of a fish recirculation system and discharge to the North Basin of the Putah Creek North Fork Cutoff (North Basin). The North Fork of Putah Creek formerly flowed eastward toward the City of Davis. It has since been segmented into three hydraulically separate basins, informally named the South, North, and East Basin. The culvert hydraulically connecting Putah Creek to the South Basin was capped and sealed in 2012.

3. Prior to adoption of WDRs Order R5-2015-0137, the Aquatic Weed Lab was regulated by WDRs Order R5-2008-0107 (NPDES Permit CA0083364), adopted by the Central Valley Water Board on 31 July 2008 and rescinded on 28 March 2014, which prescribed requirements for discharge to Putah Creek via the South Basin. The Hydraulics Lab was previously regulated by WDRs Order R5-2002-0026 (NPDES Permit CA00841182) and WDRs Order R5-2008-0131. WDRs Order R5-2002-0026 (NPDES Permit CA00841182) prescribed requirements for discharge to Putah Creek via the South Basin. Based on evidence that a discharge to Putah Creek via the South Basin was not likely to occur, WDRs Order R5-2008-0131 reclassified the Hydraulics Lab's discharge to the South Basin as a discharge to land. After WDRs Order R5-2008-0107 (NPDES Permit CA0083364) was rescinded, WDRs Order R5-2015-0137 was adopted to regulate the discharge from the Aquatic Weed Lab and Hydraulics Lab.

4. On 9 June 2016, the Discharger submitted a RWD proposing to divert the Center for Aquatic Biology and Aquaculture (CABA) Aquatic Center's (CABA Aquatic Center) discharge from Putah Creek to the North Basin such that CABA Aquatic Center and Hydraulics Lab will both discharge to the North Basin. Additional information was submitted on 7-9 September 2016. The CABA Aquatic Center's wastewater discharge to Putah Creek was regulated by WDRs Order R5-2012-0053 (NPDES Permit CA0083348) up until the adoption of this Order.

5. On 29 April 2016, the Discharger submitted the *Analytical Methods and Proposed Effluent Report* pursuant to Order R5-2015-0137 and identified the analytical methods to be used to analyze herbicide concentrations and the associated reporting limits for herbicides listed as to-be-determined in Order R5-2015-0137.

6. Order R5-2015-0137 and Order R5-2012-0053 (NPDES Permit CA0083348) will be rescinded and the Hydraulics Lab, Aquatic Weed Lab, and CABA Aquatic Center, hereafter collectively referred to as the North Fork Discharge Area, will be regulated by this Order.

7. The Discharger owns all the facilities that generate the wastewater and the associated land discharge areas. The Discharger operates the Hydraulics Lab and CABA Aquatic Center and leases the Aquatic Weed Lab to the United States Department of Agriculture (USDA). The Discharger is responsible for compliance with these Waste Discharge Requirements (WDRs).

8. The Aquatic Weed Lab is at 2705 Levee Road in Davis. The Hydraulics Lab is at 2655 Brooks Road in Davis. The CABA Aquatic Center is at 2625 Garrod Drive in Davis. All facilities occupy Section 20, T8N, R2E, MDB&M and Assessor's Parcel Numbers (APN) 036-170-25 and 0110-020-040 as shown on Attachment A, which is attached hereto and made part of this Order by reference. A more detailed site plan is shown on Attachment B, which is attached hereto and made part of this Order by reference.

CABA Aquatic Center Facility and Discharge

9. The CABA Aquatic Center consists of aquatic animal research and an aquatic animal disease laboratory. Research is focused on toxicology, nutrition, physiology, ecology, engineering, endocrinology, infectious diseases, and other related subjects. Many different species of vertebrate species are studied (trout, salmon, sturgeon, minnows, carp, catfish, striped bass, delta smelt, etc.) using basic aquatic animal husbandry methods. Invertebrates and plants are also studied depending on research needs. The facility consists of a wide array of aboveground tanks and flow-through systems that typically range in size from 10 gallons to 1,700 gallons. The CABA Aquatic Center process flow diagram is shown in Attachment C, which is attached hereto and made part of this Order by reference.

10. Source water is supplied by two groundwater wells, AC and E2A. Well AC has a maximum production rate of 800 gpm, a depth of 280 feet below ground surface (bgs), and is screened from 198 feet bgs to 238 feet bgs and 240 feet bgs to 260 feet bgs. Well E2A was connected to the CABA Aquatic Center in 2015 as a back-up water source. Well E2A is a former agricultural well with a production rate of 1,000 gpm and an approximate depth of 250 feet bgs. The screened interval for well E2A is 76 feet bgs to 96 feet bgs and 172 feet bgs to 250 feet bgs. Both wells were sampled on 10 May 2016. The water quality results are provided below.

Constituent	**Units**	**Well AC**	**Well E2A**
Fixed Dissolved Solids	mg/L	340	360
Electrical Conductivity	µmhos/cm	850	850
Total Kjeldahl Nitrogen as N	mg/L	<0.1	<0.1
Ammonia Nitrogen as N	mg/L	<0.11	<0.11
Nitrate as N	mg/L	7.4	9.1
pH	pH Units	7.9	7.7
General Minerals			
Alkalinity as CaCO3	mg/L	380	430
Hardness	mg/L	370	400
Bicarbonate as CaCO3	mg/L	380	430
Carbonate as CaCO3	mg/L	<2.0	<2.0
Calcium	mg/L	45	42
Magnesium	mg/L	62	72
Chloride	mg/L	21	23
Potassium	mg/L	1.4	1.1
Sodium	mg/L	40	41
Sulfate	mg/L	33	38
Metals			
Aluminum	µg/L	<10	19
Arsenic	µg/L	2.0	2.0
Boron	µg/L	530	560
Chromium (VI)	µg/L	25	32
Total Chromium	µg/L	28	32
Copper	µg/L	<1.0	5.8
Fluoride	µg/L	0.24	0.29
Iron	µg/L	<50	<50
Lead	µg/L	<0.1	0.2
Manganese	µg/L	<0.5	2.2

Constituent	Units	Well AC	Well E2A
Mercury	µg/L	<0.2	<0.2
Zinc	µg/L	<5.0	47

11. The following amendments are added to fish holding tanks.

Amendment	Use	Notes
Commercial Fish Feed	Maintaining fish broods	
10% iodine solution	Equipment disinfectant to prevent disease cross-contamination between fish species.	Iodine added at 10% concentration and then flushed with water
Bleach (sodium hypochlorite)	Equipment disinfectant to prevent disease cross-contamination between fish species.	1 mg/L at application point, <0.5 mg/L at discharge point.
Sodium bisulfite	Neutralize bleach after cleaning	2 mg/L at application point
Sodium chloride	Used occasionally to reduce fish stress.	3,000 mg/L maximum concentration in a single tank to mimic natural conditions

12 On an as-needed basis, various drugs and chemicals are used to clean fish tanks; treat fish for parasites, fungal growths, and bacterial infections; and to anesthetize fish prior to spawning or “tagging” processes. Based on information provided in Order R5-2012-0053 (NPDES Permit CA0083348), the periodic use and resulting concentrations of these chemicals are not expected to pose a threat to groundwater.

13. Wastewater from the aquatic animal research lab is discharged to Jamison Pond, which has a surface area of 1.17 acres and a maximum depth of 5 feet. Effluent from Jamison Pond was discharged to Putah Creek under regulation of WDRs R5-2012-0053 (NPDES Permit CA0083348), but will be diverted and discharged to the North Basin.

14. The discharge area of the North Basin is bounded to the south by an access road to the Hydraulics Lab, bounded to east by Brooks Road, and bounded to the north by Garrod Drive. The North Basin is not hydraulically linked to the South Basin or to Putah Creek. The North Basin has a surface area of 8 acres and hydraulic capacity of 23.8 MG at an elevation of 61 feet AMSL, which maintains 2 feet of freeboard to the spillover point at an elevation of 63 feet AMSL. Overflow would flow into the Agricultural Basin and into the East Basin of the North Fork Cutoff that is connected to

UCD's Arboretum. This Order requires the Discharger to install a valve, flow meter, and sampling port at the point of discharge into the North Basin.

15. The 9 June 2016 RWD included an updated water balance for the North Basin that included percolation rates based on results of infiltration testing performed in September 2015. The test trench results show that soils are predominantly sand with an average stabilized infiltration rate of 9.2 inches per hour. The updated water balance assumed a percolation rate of 4.6 inches per hour, the annual storm water contribution would be 27.1 MG per year, and evaporation would be 1.4 MG per year with less than 2 feet of wastewater accumulating in the North Basin. Based on the water balance evaluation, the Discharger determined that up to 806 MG of wastewater could be discharged per year. The current maximum pumping rate capacity (1,000 gallons per minute) of source water wells limits the wastewater discharge rate to 525.6 MG per year.

16. Prior to CABA Aquatic Center discharging to the North Basin, the Discharger shall submit a *Flow Meter and Sampling Port Installation Report* as described in the Provisions of this Order.

17. Effluent from the aquatic animal disease laboratory is chlorine disinfected, as required by the Department of Fish and Wildlife, and routed to a hydraulically isolated evaporation/percolation pond, called the Isolation Pond, for disposal. An ultraviolet (UV) light disinfection system may supplement the existing chlorine disinfection system at a later date, as a means to reduce chlorine concentrations during the disinfection process. The Isolation Pond has a surface area of 0.54 acres and is 7 feet deep. The water balance calculated an infiltration rate of 0.8 feet per day based on historical observations, which have shown that the Isolation Pond does not fill up during typical wastewater discharge rates and is consistent with conservative estimates of native materials of fine sandy loam and Yolo Silt Loam. Based on the water balance, the Isolation Pond can accommodate an annual wastewater discharge of 33.5 MG.

18. The following table shows April 2016 monitoring results of wastewater discharged to Jamison Pond and the Isolation Pond. Additional monitoring results submitted as part of the 2007 NPDES permit revision and submitted pursuant to WDRs R5-2012-0053 (NPDES Permit CA0083348) are also included.

Constituent	**Units**	**Jamison Pond Influent [1]**	**Jamison Pond Effluent**	**Isolation Pond [1]**
Biochemical Oxygen Demand	mg/L	<6.0	—	<6.0
Chemical Oxygen Demand	mg/L	<50	—	<50

Constituent	**Units**	**Jamison Pond Influent [1]**	**Jamison Pond Effluent**	**Isolation Pond [1]**
Dissolved Oxygen	mg/L	—	—	9.9 (8.5-18.0)[2]
Settleable Matter	mL/L/hr	<0.20	<0.1[2]	<0.2
Total Suspended Solids	mg/L	13	4.4 (<1.0-5.0)[2]	<10
Total Dissolved Solids	mg/L	636	465 (353-550)[2]	423
Fixed Dissolved Solids	mg/L	284	—	347
Electrical Conductivity	µmhos/cm	822	795 (740-880)[2]	675 (463-778)[2]
Total Kjeldahl Nitrogen as N	mg/L	0.17	—	0.27
Ammonia Nitrogen as N	mg/L	<0.11	3.0 (0.47-8.2)[3]	<0.11
Nitrate as N	mg/L	7.4	—	4.4
pH	mg/L	8.0	8.0 (7.9-8.1)[2]	8.0 (7.9-8.7)[2]
General Minerals				
Alkalinity as CaCO3	mg/L	390	—	318
Hardness	mg/L	369	372 (340-399)[2]	264
Bicarbonate as CaCO3	mg/L	390	—	318
Carbonate as CaCO3	mg/L	<2.0	—	<2.0
Calcium	mg/L	45.2	—	34.2
Chloride	mg/L	21.2	20 (10 -26)[2]	23.2
Magnesium	mg/L	61.7	—	43.4
Potassium	mg/L	1.5	—	1.7
Sodium	mg/L	39.6	—	61
Sulfate	mg/L	32.8	29.6 (29-30)[3]	36.4
Metals				
Aluminum	µg/L	119	<50[3]	14.9
Arsenic	µg/L	2.4	2.7 (1.9-3.3)[3]	2.9
Barium	µg/L	183	—	121

Constituent	**Units**	**Jamison Pond Influent [1]**	**Jamison Pond Effluent**	**Isolation Pond [1]**
Boron	µg/L	530	—	653
Chromium (VI)	µg/L	25.4	22 (18 – 29)[2]	17.7
Total Chromium	µg/L	27.9	—	19.3
Copper	µg/L	2.4	1.5 (0.96-1.8)[3]	2.5
Fluoride	µg/L	0.24	260 (230-280)[3]	0.12
Iron	µg/L	<50	41 (<20-133)	<50
Lead	µg/L	<0.1	<0.5[3]	0.18
Manganese	µg/L	0.59	<10[3]	6.8
Zinc	µg/L	6.4	2.3 (<1.0-4.3)[3]	13.1
Mercury	ng/L	<0.20	2.0 (1.2-3.2)[3]	<0.20
Volatile Organic Compounds				
Bromoform	µg/L	<0.5	—	0.8 (<0.5-4.9)[2]
Chloroform	µg/L	1.9	—	0.7 (<0.5-2.0)[2]
Total Trihalomethanes	µg/L	—	—	1.5 (<0.5-7.7)[2]

1 Monitoring results from April 2016 unless otherwise noted.

2 Average and range of monitoring results from August 2012 through July 2016 under WDRs R5-2012-0053 (NPDES Permit CA0083348).

3 Average and range of three sampling events performed in 2007 as part of the NPDES permit revision.

19. Domestic wastewater generated from the facility is discharged to one of two on-site septic systems permitted through Yolo County.

20. Storm water runoff is maintained on-site and naturally flows north to agricultural fields owned by the discharger.

Hydraulics Lab Facility and Discharge

21. The Hydraulics Lab conducts experiments on hydraulics and fish swimming performance, behavior, and physiological response. The facility has both indoor and outdoor areas for engineering and fish experiments.

22. The main building houses the indoor area and currently contains two flumes, a fish treadmill, six 60-gallon tanks, two 95-gallons tanks, and a temperature controlled head tank for water recirculation. The number and size of tanks may vary depending on experimental needs. The current capacity of the indoor system is 80,000 gallons. The water is typically replaced every two to four weeks. The Hydraulic Lab's process flow diagram is shown in Attachment D, which is attached hereto and made part of this Order by reference.

23. The outdoor area is canopy-covered and currently contains a large flume and four 290-gallon holding tanks. The fish holding tanks are used to hold fish before and after experiments are conducted. Water used in the outdoor flume may be used for experiments involving fish, river bottom soils and/or riparian plants prior to discharge. The number and size of tanks may vary depending on experimental needs. Soil and plants are returned to their point of origin after experimentation. The capacity of the outdoor system is 96,000 gallons, and depending on the type of experiment, may be replaced every two to four weeks.

24. Source water for the laboratory is drawn from UCD supplied potable water or nearby Well C3C, previously used as an agricultural supply well and constructed in 1932 to a depth of 270 feet. The UCD supplied potable water system consists of six on-campus groundwater wells that have a screened depth between 800 and 1,400 feet bgs. The water is disinfected using chlorine to a residual level of 0.5 mg/L before being distributed. The May 2015 RWD provided quarterly sampling results from 2012. The following table shows the UCD Potable water supply quality from the six supply wells.

Constituent	**Units**	**UCD Potable Water Avg. (Min. – Max.)**
pH	pH units	8.4 (8.4 - 8.4)
EC	µmhos/cm	535 (520 - 560)
TDS	mg/L	305 (300 - 310)
NO3 as N	mg/L	2.5 (1.5 - 5.0)
Bicarbonate	mg/L	198 (190 - 210)
Carbonate	mg/L	12.2 (8.8 - 15)
Calcium	mg/L	16 (15 - 19)
Chloride	mg/L	21 (16 - 23)

Constituent	**Units**	**UCD Potable Water Avg. (Min. – Max.)**
Magnesium	mg/L	18 (17 - 21)
Potassium	mg/L	1.9 (1.6 - 2.6)
Sodium	mg/L	73 (70 - 76)
Sulfate	mg/L	36 (36 - 36)
Boron	µg/L	0.64 (0.59 - 0.72)
Chromium VI	µg/L	6.7 (4.2 - 13.0)
Fluoride	µg/L	160 (130 - 180)
Iron	µg/L	0.04 (0.03 - 0.05)
Manganese	µg/L	0.01 (0.01 - 0.01)

25. Water quality results of Well C3C from samples collected on 28 June 2008 and 10 July 2015 are provided below.

Constituent	**Units**	**Well C3C 2008 Sample**	**Well C3C 2015 Sample**
pH	pH units	--	7.7
EC	µmhos/cm	700	740
TDS	mg/L	430	430
TKN as N	mg/L	--	<0.2
Nitrate as N	mg/L	5.9	2.9
Ammonia as N	mg/L	0.14	--
Bicarbonate	mg/L	--	230
Carbonate	mg/L	--	<5.0
Calcium	mg/L	--	36
Chloride	mg/L	22	22
Magnesium	mg/L	--	51
Potassium	mg/L	--	1.4
Sodium	mg/L	--	34
Sulfate	mg/L	33	--
Arsenic	µg/L	1.5	2.5

Constituent	**Units**	**Well C3C 2008 Sample**	**Well C3C 2015 Sample**
Boron	µg/L	--	500
Total chromium	µg/L	25	19
Chromium VI	µg/L	24	--
Iron	µg/L	--	<100
Manganese	µg/L	--	10

Hydraulics Lab Facility – Description of Hydraulic and Fish Swimming Experimentation Wastewater

26. The RWD states that no chemicals or toxins are added to water used for hydraulic or fish swimming experimentation. Since a study was not performed to determine the effects of amendments on the receiving groundwater, chemical amendments are not permissible for experimentation.

27. Only untreated on-site well water is used for experiments involving fish due to their sensitivity to chlorine. Water used in fish experiments is air-equilibrated and temperature controlled in the indoor system and air-equilibrated at ambient temperature in the outdoor system.

28. Each flume includes a storage tank that is used as a settling tank for the effluent prior to discharge. Discharges occur intermittently and only during periods of experimentation. From July 2010 through July 2015, the facility had an annual average flow of 790,000 gallons.

29. Hydraulic experimentation occurs when funding or a proposal has been awarded to the lab. For example, a previous project entitled The Roughness Study of the California Native Vegetation in Floodways was funded from 01 September 2008 to 30 June 2009. The project involved four experimental runs, each testing a different riparian plant with sediment collected from the Sacramento River using the outdoor flume. Each experiment consisted of three replicate batches with eight trials in each batch. Water was discharged after each batch study and not reused between batches. Each experiment lasted for two or three months and required discharging three times. Typical volumes for each discharge were 20,000 to 30,000 gallons. Setup time between experiments was about two weeks.

30. Hydraulic and fish swimming experimentation wastewater is not biologically or physically treated prior to discharge. Order R5-2008-0131 required effluent monitoring of electrical conductivity (EC) and dissolved oxygen (DO). From July 2010 through July 2015, the EC concentration ranged from 387 to 701 µmhos/cm with a

flow weighted average of 594 µmhos/cm and the DO concentration ranged from 6.7 to 11.5 mg/L.

31. Hydraulic and fish swimming experimentation wastewater is discharged in batches to the South Basin or to a retention basin (herein Retention Basin 1). Retention Basin 1 has a hydraulic ponding capacity of 126,000 gallons. The discharge specifications of Order R5-2015-0137 stated that discharge to Retention Basin 1 could not occur when ponding water was visible. The Discharger proposes to maintain this discharge specification.

32. The discharge area of the South Basin is bounded to the south by Levee Road, bounded to the north by an agriculture basin (a concrete holding pond previously used to hold irrigation water), and bounded to the east by Brooks Road. The South Basin has a surface area of 3.7 acres and hydraulic capacity of 4.6 million gallons (MG) at an elevation of 60 feet above mean sea level (AMSL), which maintains 4 feet of freeboard to the spillover point to Putah Creek. A water level at 60 feet AMSL will inundate Ponds 1 and 2 but wastewater will remain on site. As described in the following section, wastewater from the Aquatic Weed Lab is also discharged to the South Basin.

33. The Discharger's water balance of the South Basin utilized conservative assumptions of no percolation or evaporation and determined that up to 1.7 MG of wastewater could be discharged annually without exceeding a water elevation of 60 feet AMSL (4.6 MG storage capacity) during a 100-year, 365-day precipitation event. The total annual storm water contribution was determined to be 2.9 MG.

    A revised water balance dated 23 May 2019, utilizing similar infiltration rates from a 2015 geotechnical study performed at the North Basin, demonstrated that the South Basin has an annual disposal capacity of 1,290 MG. The water balance was based on an annual pond evaporation rate of approximately 68 inches per year and an infiltration rate of 9.2 feet per day. The site soil type was determined to be the Reiff series, fine to very fine sandy loam on alluvial fans, similar soils as mapped at the North Basin. The Discharger requested an annual flow increase from 1.7 MG to 400 MG. Additional information is needed to demonstrate that this increase will not cause groundwater mounding, affect local hydraulic gradients, decrease the available vadose zone which may decrease the removal of certain pollutants, or cause indirect discharge to Putah Creek. An annual flow of 60 MG will be allowed until such a time a hydrogeological evaluation of the site has been performed. An annual flow of 60 MG is 5 percent of the annual disposal capacity as calculated in the revised water balance and corresponds to an infiltration rate of 0.4 feet per day.

Hydraulics Lab – Description of Fish Recirculation System Wastewater

34. In 2015, the Discharger constructed a fish recirculation system to maintain fish on-site and perform joint research between the Civil and Environmental Engineering Department and the Wildlife, Fish, and Conservation Biology Department.

35. The fish recirculation systems consists of a large head tank for well water aeration, four 2,000-gallon tanks, one 3,500-gallon tank, four 300-gallon tanks, and two 500-gallon tanks. The number and size of tanks may vary depending on experimental needs. The water supply is from Well C3C on a demand basis. The tanks are connected to a recirculating system designed to maintain the required levels of dissolved oxygen for fish survival. The tanks are designed to discharge a cumulative 35 gpm continuously but may discharge up to 125 gpm.

36. The following amendments are added to the fish recirculation system's source water.

Amendment	**Use**
Commercial Fish Feed	Maintaining fish broods
10% iodine solution	Equipment disinfectant to prevent disease cross-contamination between fish species.
Bleach (5.25% sodium hypochlorite)	Equipment disinfectant to prevent disease cross-contamination between fish species.
Sodium chloride	Used occasionally to reduce fish stress.

37. The recirculated water is treated through physical and biological means to maintain healthy water for the fish. Standard practices are employed to maintain fish in captivity and are consistent with the University's Institutional Animal Care and Use Committee guidelines. Such practices may include physical treatment consisting of activated carbon, zeolite, ultraviolet light, or mechanical filters. Cultured natural anaerobic and aerobic bacteria may be used to reduce nitrogen ammonia to nitrogen gas. Wastewater is not treated prior to discharge.

38. The effluent character of the fish recirculation system is similar to CABA Aquatic Center's aquatic animal research aquaculture system described above. Wastewater from the fish recirculation system is discharged to the North Basin. The current maximum pumping rate capacity (125 gallons per minute) of the source water well limits the wastewater discharge rate to 65.7 MG per year.

39. Domestic wastewater generated from the facility is discharged to an on-site septic system that is permitted through Yolo County.

40. Storm water runoff is maintained on-site and naturally flows to Retention Basin 1 or the South Basin, which is accounted for in the Discharger's water balance.

Aquatic Weed Control Lab Facility and Discharge

41. The Aquatic Weed Lab conducts research on the biology and ecology of invasive aquatic and riparian weed species, prevention of weed invasions, integrated management methods for management of invasive aquatic and riparian plant species, and ecological restoration of invaded aquatic and riparian ecosystems.

42. The facility consists of offices, a main laboratory, a laboratory annex, two greenhouses, a headhouse, an outdoor research area, two septic systems with leach fields, retention Ponds 1 and 2, and the South Basin. The Aquatic Weed Lab's process flow diagram is shown in Attachment E, which is attached hereto and made part of this Order by reference.

43. Source water used by the facility is supplied by the UCD potable water supply system. The water quality of UCD supplied potable water is described in Finding 24.

44. Domestic wastewater from the office building is discharged to the west septic system and domestic wastewater from the headhouse is discharged to the south septic system. Both systems are permitted through Yolo County. No other wastewater is generated at these buildings. The headhouse is used for sample processing (i.e., sorting), dish washing, and equipment storage.

45. The main laboratory is used to analyze soil and plant samples for total carbon and nitrogen. All wastewater from the main laboratory is conveyed to fiberglass evaporation vaults, which are located within concrete secondary containment and under a Plexiglas roof. The evaporation vaults are inspected monthly. The inspection includes evaluation of the secondary containment, roof integrity, tank integrity, piping integrity, and fill level. If any water is detected in the secondary containment, the evaporation tanks are emptied and inspected for leaks, which are fixed prior to putting the evaporation vaults back in service. If the evaporation vaults are at 80 percent capacity, the water is pumped out and hauled to the UC Davis wastewater treatment plant for disposal.

46. The laboratory annex is used to prepare plant, soil, and water samples, which are then transferred to the main laboratory for analysis. The laboratory annex has three sinks. Sink drainage is limited to handwashing with water and soap. Wastewater from the sinks is conveyed to holding tanks.

47. The greenhouses are used to conduct experiments on plant growth responses and grow plant cultures. The two greenhouses contain trench drains in the floors that collect overflow water from indoor plant culture experiments. Wastewater from the trench drains are conveyed to the two retention ponds.

48. The outdoor research area is used for growing plant cultures and experiments on plant response. Experiments on plant cultures are conducted in tanks or vaults on

concrete pads. The outdoor research area also consists of two cement canals, which have not been used in over ten years. The number of tanks or canals in use depends on the experiments being conducted. Experiments typically evaluate plant responses to water depth, light regimes, or other environmental variables. Water is typically circulated through the tank, vault, or canal during experiments. The tanks and vaults have bottom drains that connect to the collection system beneath the concrete pad. The collection system captures all wastewater generated from the tanks and vaults, and any storm water. Only one vault or tank is drained at a time to prevent flooding of the drain system. Wastewater from the concrete pads and canals is conveyed via gravity feed to Pond 1.

49. The outdoor research area currently has forty-eight 55-gallon plastic containers, which can be used for aquaculture experiments using herbicides. Only containers without bottom drains are used for experiments with herbicides. If experiments utilize herbicides, water is manually pumped from the containers to holding tanks. If no herbicides are used in the containers, the wastewater is pumped to the drains beneath the concrete pad and flows directly to Pond 1.

50. Wastewater from outdoor research area experiments containing herbicides and wastewater from the laboratory annex is stored in one of two 2,000 gallon holding tanks. After granular activated carbon (GAC) treatment, treated wastewater is stored in the second 2,000-gallon storage tank and tested prior to discharge into Pond 1. If the sample results exceed the effluent limits, wastewater will either be treated again or hauled to a locally permitted wastewater treatment system for disposal.

51. The facility contains two unlined retention ponds, Pond 1 and Pond 2. Each pond is approximately 20,000 square feet and has a maximum depth of 3 feet to the outlet points. Pond 1 typically contains water year-round from the greenhouse discharge. A culvert allows water from Pond 1 to overflow to Pond 2. Discharge from Pond 2 gravity feeds to the South Basin and is controlled by a manually operated valve. A valve, flow meter, and sampling port are located at the discharge point to the South Basin.

52. Experiments and potted plant cultures are usually grown in aquatic mesocosms without adding any nutrients to the water since rooted aquatic plants acquire most of their nutrients from sediment. If nutrients are added, the experiments are designed to mimic high and low aqueous nutrient concentrations measured at field sites. For these experiments, a modified Hoagland's solution (a hydroponic nutrient solution) is used at full strength or diluted with deionized water to create the experimental conditions. The Hoagland's solution consists of the following concentrations of nutrients.

Nutrient	**Maximum Concentration**
Potassium nitrate	5 mg/L nitrogen
Sodium phosphate	2 mg/L phosphorus

Nutrient	Maximum Concentration
Potassium bicarbonate	47 mg/L potassium
Calcium chloride	40 mg/L calcium
Magnesium sulfate	9.6 mg/L magnesium, 12.8 mg/L sulfur
Boric acid	0.27 mg/L boron
Manganese sulfate	0.27 mg/L manganese
Zinc sulfate	0.13 mg/L zinc
Copper sulfate	0.03 mg/L copper
Ammonium molybdate	0.01 mg/L molybdenum
Iron EDTA	0.04 g/L iron

53. Herbicides previously or potentially used at the lab are listed in the table below. Each herbicide is approved by the USEPA. All the herbicides are registered in California except “Stingray”, which has an active ingredient of carfentrazone-ethyl and is pending approval for being a California registered herbicide. On 29 April 2016, the Discharger submitted the *Analytical Methods and Proposed Effluent Report*, which identified the analytical methods to be used to analyze herbicide concentrations and the associated reporting limits for herbicides listed in the table below. The Discharger proposes to only discharge herbicide wastewater when the active ingredients are less than the reporting limit. However, the Discharger requested that the effluent limit for elemental copper be increased to due limitations of GAC treatment and the concentration of copper in the source water, which was reported to have a concentration with a 90th percentile of 91 µg/L.

Herbicide Trade Name	Active Ingredient	Maximum Concentration (µg/L)	Reporting Limit (µg/L)
Weedar 64	2-4-Diethyl amine	4,000	5
Tradewind	Bispyribac-sodium	45	0.5
Stingray	Carfentrazone-ethyl	200	0.01
Cutrine Plus	Elemental copper	1,000	1
Reward	Diquat dibromide	380	4
Aquathol K	Endothall	5,000	45
Clipper	Flumioxazin	400	0.01
Sonar AS	Fluridone	150	1
Rodeo	Glyphosate	1,860	5
Clearcast	Imazamox	500	0.5
Habitat	Imazapyr	552	0.5
Galleon	Penoxsulam	150	1
Renovate 3	Triclopyr	2,500	0.1

54. The Discharger also proposes to utilize herbicides that are approved by the USEPA but have not been registered in California. Prior to discharging wastewater containing unregistered herbicides, this Order requires the Discharger to evaluate the potential of the active ingredients to degrade groundwater, determine the reporting limit, and propose an effluent limit.

55. Under WDRs Order R5-2008-0107 (NPDES Permit CA0083364) effluent sampling was only performed for discharges to Putah Creek, not including the South Basin. The Discharger has not discharged to Putah Creek since 2000. The Discharger last characterized effluent from Pond 2 to the South Basin on 5 January 2006, prior to the 2008 NPDES permit renewal. On 2 April 2015, the Discharger took effluent samples from both greenhouses, a non-herbicide experiment being conducted at the outdoor research area, the holding tanks, and from the evaporation tank. The sampling results are provided in the following table.

Constituent	**Units**	**NGH[1]**	**SGH[1]**	**Outdoor Research Area [1,2]**	**Holding Tanks[1]**	**Pond 2 Effluent[3]**	**Evaporation Tank [1,4]**
pH	pH units	8.96	8.33	8.78	8.44	8.12	8.76
EC	µmhos/cm	550	520	85	720	320	230
TDS	mg/L	370	280	74	420	250	1,400
COD	mg/L	9.3	7.2	<7.0	20	-	180
TKN as N	mg/L	0.62	<0.2	0.4	1.5	-	6.7
NO_3 as N	mg/L	<0.5	<0.5	<0.5	4.7	<0.23	<0.5
Bicarbonate	mg/L	200	90	34	210	-	190
Carbonate	mg/L	25	<5.0	<5.0	<5.0	-	19
Calcium	mg/L	17	22	12	19	-	13
Chloride	mg/L	18	75	0.59	45	13	260
Magnesium	mg/L	20	11	1.9	20	-	12
Potassium	mg/L	2.3	4.8	1.4	5.7	-	82
Sodium	mg/L	86	66	1.1	100	-	370
Sulfate	mg/L	33	34	2.2	42	4.1	220
Aluminum	µg/L	<50	<50	<50	50	220	76
Arsenic	µg/L	5	<2	<2	24	2.9	17
Chromium VI	µg/L	-	-	-	-	2.3	-
Total Chromium	µg/L	-	-	-	-	2.2	-
Copper	µg/L	<10	<10	<10	1,200	3.8	14
Fluoride	µg/L	240	220	<100	<100	<100	260

Constituent	Units	NGH[1]	SGH[1]	Outdoor Research Area [1,2]	Holding Tanks[1]	Pond 2 Effluent[3]	Evaporation Tank [1,4]
Iron	µg/L	<100	<100	<100	<100	<300	120
Lead	µg/L	<5	<5	<5	<5	0.15	<5
Mercury	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	µg/L	<20	<20	<20	<20	12	<20
Nickel	µg/L	-	-	-	-	1.8	-
Zinc	µg/L	<20	<20	<20	66	92	42

[1] NGH = North Greenhouse. SGH = South Greenhouse. Samples taken on 2 April 2015.

[2] The experiment conducted during the time of sampling used deionized source water.

[3] Effluent sample to the South Basin taken on 5 January 2006.

[4] Evaporation tanks have double containment and do not discharge to the retention ponds or the South Basin.

56. From 2010 through 2014, the average daily flow to the South Basin was approximately 2,400 gallons per day (gpd). The potential peak daily flow rate is 20,000 gpd, which includes filling and discharging the holding tanks and the outdoor research area tanks and vaults once per day. However, this is an unlikely scenario because experiments are typically run for several weeks or months.

57. Experimental plants are harvested and analyzed on-site. After analysis, native plants are disposed of in campus dumpsters for composting as landscape material. Per protocols developed by the University and Yolo County Agricultural Commissioner for disposal of all invasive weeds and/or transgenic plant material, experimental plants that are exotic and/or invasive weeds are autoclaved on site or steam injected for 24 hours at the University's Department of Plant Sciences autoclave. The autoclaved plant material is disposed at the Yolo County Landfill.

58. All hazardous chemical waste is collected in storage containers provided by the University Environmental Health and Safety (EH&S). Containers are labelled as chemical hazardous waste and removed from the facility by EH&S for disposal at a permitted facility.

59. Storm water runoff is maintained on-site and naturally flows to Pond 1, Pond 2, or the South Basin.

Site-Specific Conditions

60. The facilities are located west of Highway 113 and are part of the west campus of UCD located in the Putah Creek Plain of the Sacramento River Valley. The terrain at the site is predominately flat. Surface water from the surrounding area flows to the North Fork Cutoff basins or via surface runoff or a storm water collection system with an outfall to Putah Creek.

61. The May 2015 RWD states that the eastern portion of the North Fork Discharge Area is located within the 100-year floodplain based on a 2002 FEMA map. However, a more recent FEMA flood map from 2010 shows that the facilities are not located within a 100 year flood zone. Putah Creek has a 100 year water level of 44.8 feet AMSL. The levee that separates the South Basin from Putah Creek is at an elevation of 64 feet AMSL.

62. Soils are characterized predominately as the Yolo Series, fine sandy loam found on alluvial fans, which have a moderate to high percolation rate. The Discharger states that rainfall percolates below ground surface within 24 hours after a precipitation event. Infiltration rates for the North Basin were evaluated in September 2016. The results were submitted as Appendix C of the June 2016 RWD. Test trench results show that soils are predominantly sand with an average stabilized infiltration rate of 9.2 inches per hour.

63. Land use in the west campus is primarily agriculture field research lands. Crops change regularly based on research needs. West campus also contains various research facilities and an airport.

Groundwater Conditions

64. Well C3C is used to supply source water for the Hydraulics Lab and located adjacent and upgradient of the South Basin. Three agricultural supply wells (Wells E2A, C2A, and C2F) are active within 3,000 feet downgradient of the North Fork Discharge Area. These wells may influence the vertical groundwater gradient when they are actively pumping. Recharge to the shallow aquifer primarily occurs from Putah Creek, a losing stream, and from storm water and excess irrigation water infiltration.

65. Groundwater monitoring has not previously been required at the Hydraulics Lab or the Aquatic Weed Lab and the groundwater underlying those sites has not been characterized.

66. The CABA Aquatic Center has three groundwater monitoring wells GW-003, GW-004, and GW-005 (formerly named P3, P4, and P5, respectively) to characterize groundwater at the site. From 2007 through 2014, the monitoring wells had an average groundwater elevation of 19.5 feet AMSL, corresponding to a depth to groundwater of 32.8 feet bgs. The highest groundwater elevation in the groundwater

monitoring wells was 29.4 feet AMSL, corresponding to a depth to groundwater of 22.9 feet bgs. The groundwater gradient flows northeast with a gradient of 0.001 to 0.005 feet/feet. The Discharger determined the groundwater depth below the discharge ponds and basins using the highest groundwater elevation. The results are summarized in the table below.

Discharge Area	**Depth to Groundwater Below Base of Discharge Area**
Aquatic Weed Lab Pond 1 and Pond 2	25.6 feet
Hydraulics Lab Retention Basin 1	31.6 feet
CABA Aquatic Center Jamison Pond	39.6 feet
CABA Aquatic Center Isolation Pond	29.6 feet
North Fork Cutoff South Basin	22.9 feet
North Fork Cutoff North Basin	13.7 feet

67. Available groundwater monitoring data from January 2010 through March 2016 for GW-003, GW-004, and GW-005 is summarized below. Monitoring well GW-003 is the most upgradient and was also used to provide an indication of background groundwater quality at the Aquatic Weed Lab and Hydraulics Lab.

Constituent	**Units**	**CABA Aquatic Center Groundwater Quality Avg. (Min. – Max.)**		
		GW-003	**GW-004**	**GW-005**
pH[1]	pH units	7.55 (7.48 – 7.65)	7.5 (7.4 –7.6)	7.5 (7.4 –7.7)
EC[2]	µmhos/cm	810 (690 – 920)	774 (670 – 888)	766 (680 – 867)
TDS[2]	mg/L	472 (385 – 630)	451 (390 – 540)	448 (350 – 510)
NO_3 as N[1]	mg/L	4.6 (2.9 – 6.6)	3.1 (2.0 – 4.1)	4.5 (2.7 – 5.8)
Total Nitrogen	mg/L	4.7 (3.1 – 6.6)	3.3 (2.6 – 4.1)	4.6 (2.7 – 6.0)
Oxytetracycline	mg/L	ND	ND	ND
Formaldehyde	µg/L	ND	ND	ND
Bicarbonate[1]	mg/L	388 (360 – 420)	360 (330 – 400)	365 (340 – 410)
Carbonate[1]	mg/L	<5.0	<5.0	<5.0
Calcium[1]	mg/L	40 (35 – 46)	42 (33 – 50)	41 (34 – 47)
Chloride[1]	mg/L	22 (20 – 24)	21 (18 – 23)	21 (18 – 22)
Magnesium[1]	mg/L	77 (70 – 88)	61 (53 – 69)	63 (54 – 71)
Potassium[1]	mg/L	<1	<1.1	<1.1
Sodium[1]	mg/L	43 (37 -51)	44 (37 – 51)	48 (41 – 54)
Sulfate[1]	mg/L	47 (33 – 71)	33 (29 – 35)	33 (29 – 35)

Constituent	Units	CABA Aquatic Center Groundwater Quality Avg. (Min. – Max.)		
		GW-003	GW-004	GW-005
Arsenic[1]	µg/L	2.7 (2.3 – 3.0)	2.3 (<2 – 6.8)	2.9 (2.1 – 6.8)
Boron[1]	µg/L	631 (530 – 720)	594 (480 – 740)	623 (530 – 770)
Chromium (VI)[3]	µg/L	15 (6 – 24)	5.0 (<1 – 15)	8.1 (1.1 – 19)
Total chromium[2]	µg/L	19 (<10 – 82)	10 (<10 – 73)	14 (<10 – 80)
Copper[1]	µg/L	<10	<10	<10
Fluoride[1]	µg/L	390 (190 – 540)	195 (61 – 300)	229 (83 – 350)
Iron[1]	µg/L	<100	<100	<100
Lead[1]	µg/L	<5.0	<5.0	<5.0
Mercury[1]	µg/L	<0.20	<2 (<2 – 0.4)	<0.22
Manganese[1]	µg/L	<20	<20	<20
Nickel[1]	µg/L	<20	<20	<20
Zinc[1]	µg/L	<20	<20	<20

[1] Average and range of quarterly data from first quarter of 2011 through second quarter of 2012.

[2] Average and range of quarterly data from third quarter of 2010 through first quarter of 2016.

[3] Average and range of quarterly data from third quarter of 2012 through first quarter of 2016.

68. Groundwater monitoring results from GW-003 were used as an indication of groundwater quality upgradient of the Hydraulics Lab and Aquatic Weed Lab. Well C3C, used as source water at the Hydraulics lab, is located adjacent and upgradient of the South Basin, as indicated in Attachment B, and was used to provide an indication of downgradient groundwater quality (data provided above).

Basin Plan, Beneficial Uses, and Regulatory Considerations

69. The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins,* Fourth Edition (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Board. Pursuant to Water Code section 13263(a), waste discharge requirements must implement the Basin Plan.

70. Local drainage is to Putah Creek. The beneficial uses of surface water, as stated in the Basin Plan, are municipal and domestic supply; agricultural supply; industrial process supply; hydropower generation; water contact recreation; non-contact water recreation; warm freshwater habitat; cold freshwater habitat; wildlife habitat; and spawning, reproduction, and/or early development.

71. The beneficial uses of underlying groundwater as set forth in the Basin Plan are municipal and domestic supply, agricultural supply, industrial service supply and industrial process supply.

72. The Basin Plan establishes narrative water quality objectives for chemical constituents, tastes and odors, and toxicity in groundwater. It also sets forth a numeric objective for total coliform organisms.

73. The Basin Plan's numeric water quality objective for bacteria requires that the most probable number (MPN) of coliform organisms over any seven-day period shall be less than 2.2 per 100 mL in MUN groundwater.

74. The Basin Plan's narrative water quality objectives for chemical constituents, at a minimum, require waters designated as domestic or municipal supply to meet the MCLs specified in Title 22 of the California Code of Regulations (hereafter Title 22). The Basin Plan recognizes that the Central Valley Water Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.

75. The narrative toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, animal, plant, or aquatic life associated with designated beneficial uses.

76. Quantifying a narrative water quality objective requires a site-specific evaluation of those constituents that have the potential to impact water quality and beneficial uses. The Basin Plan states that when compliance with a narrative objective is required to protect specific beneficial uses, the Central Valley Water Board will, on a case-by-case basis, adopt numerical limitations in order to implement the narrative objective.

    In the absence of specific numerical water quality limits, the Basin Plan methodology is to consider any relevant published criteria. General salt tolerance guidelines, such as Water Quality for Agriculture by Ayers and Westcot and similar references indicate that yield reductions in nearly all crops are not evident when irrigation water has an EC less than 700 µmhos/cm. There is, however, an eight- to ten-fold range in salt tolerance for agricultural crops and the appropriate salinity values to protect agriculture in the Central Valley are considered on a case-by-case basis. It is possible to achieve full yield potential with waters having EC up to 3,000 µmhos/cm if

the proper leaching fraction is provided to maintain soil salinity within the tolerance of the crop.

Antidegradation Analysis

77. State Water Resources Control Board Resolution 68-16 ("Policy with Respect to Maintaining High Quality Waters of the State") (hereafter Resolution 68-16) prohibits degradation of groundwater unless it has been shown that:

    a. The degradation is consistent with the maximum benefit to the people of the state.

    b. The degradation will not unreasonably affect present and anticipated future beneficial uses.

    c. The degradation does not result in water quality less than that prescribed in state and regional policies, including violation of one or more water quality objectives, and

    d. The discharger employs best practicable treatment or control (BPTC) to minimize degradation.

78. Operations at the North Fork Discharge Area began in the 1960s. Groundwater monitoring wells GW-003, GW-004, and GW-005 were installed in August 2007. Therefore, it is not possible to determine groundwater quality or background groundwater conditions prior to 1968. Determination of compliance with Resolution 68-16 must be based on background groundwater quality expected to be representative of groundwater quality upgradient of the entire North Fork Discharge Area, as indicated by Monitoring Well GW-003. Downgradient groundwater data from monitoring wells GW-004 and GW-005, and source water Well C3C indicate that groundwater degradation has not occurred.

79. Based on the provided effluent and groundwater data, the effluent discharge from the North Fork Discharge Area is not expected to cause degradation of groundwater. However, effective source control, treatment, and control measures are required to be implemented to maintain current effluent quality. Therefore, this Order establishes performance based effluent limits determined to be protective of groundwater but does not require groundwater monitoring at this time.

80. Constituents may concentrate during experimentation and holding prior to discharge due to evaporation. Implementing best management practices and appropriately scheduling experiments will require discharging effluent without excessive delay. This Order allows a reasonable salinity increase for effluent disposal of 200 mg/L TDS over source water. The TDS concentration of the UCD supply water is reported to have an average of 305 mg/L and Well C3C was reported to be 430 mg/L. Thus, this Order

contains a performance based TDS monthly average effluent limitation of 630 mg/L, which shall be calculated based on all discharge flows

81. For nutrients such as nitrate, the potential for groundwater degradation depends on wastewater quality; crop uptake, and the ability of the vadose zone below the disposal areas to support nitrification and denitrification to convert the nitrogen to nitrogen gas before it reaches the water table. Groundwater monitoring well GW-003 shows nitrate to range between 2.9 and 6.6 mg/L. Wastewater quality from the current discharge sources is less than the groundwater quality but sampling data is limited. Based on the provided wastewater quality data from the CABA fish recirculation system, the effluent nitrate concentration of the proposed fish recirculation is expected to remain below the Basin Plan groundwater quality objective of 10 mg/L but has the potential to exceed the groundwater quality. However, the Hydraulic Lab does not use nitrogen as a supplement during experiments. Wastewater quality from the Aquatic Weed Lab is limited and nitrate is used for plant nutrition during experiments. Therefore, to limit the potential for nitrate degradation this Order sets a total nitrogen effluent limit for discharges from the Aquatic Weed Lab and the discharge from the Hydraulic Lab's fish recirculation system.

82. Herbicide concentrations will be further reduced when discharged to Pond 1 where dilution with wastewater not containing herbicides will occur. The Discharger also maintains vegetative growth in Ponds 1 and Ponds 2 and prevents breeding of mosquitoes through methods such as mosquitofish. The final concentrations of herbicides discharged to the South Basin are expected to be considerably less than if herbicides where used to control vegetation in the ponds.

83. Prior to using new herbicides not registered in California or not used in accordance with label specifications, the Discharger must obtain the Executive Officer's permission by submitting an *Herbicide Evaluation Report* that evaluates the active ingredient's potential to degrade groundwater. The report shall propose the effluent limit based on the determined reporting limit of the active ingredient(s). Upon approval by the Executive Officer, this Order allows use of the herbicide and sets the effluent limit at the established reporting limit.

84. Aquaculture chemicals for tank cleaning or antibiotics for aquatic husbandry are used in batches and are discharged at concentrations not expected to pose a threat to groundwater. However, the use of these chemicals must be reported as specified in the Monitoring and Reporting Program.

85. This Order establishes effluent and groundwater limitations for the North Fork Discharge Area that will not unreasonably threaten present and anticipated beneficial uses or result in groundwater quality that exceeds water quality objectives set forth in the Basin Plan. The nature of the waste, site-specific conditions and available

groundwater monitoring data indicate that the discharge does not pose a threat of degradation. The requirements of this Order do not allow any degradation to occur.

86. The Discharger provides treatment and control of the Aquatic Weed Lab discharge that incorporates:

    a. Using plastic storage tanks to store wastewater containing herbicides prior to treatment and disposal;

    b. Granular activated carbon treatment to remove herbicides from the wastewater;

    c. Herbicides are not used to stop vegetative growth in Pond 1 or Pond 2. This prevents additional herbicides from being added to the wastewater and maintaining vegetative growth has the potential to provide further herbicide removal; and

    d. Using deionized source water in experiments performed at the outdoor research area. While all experiments may not require the use of deionized water, the occasional use provides potential for constituent dilution when wastewater is commingled in Pond 1.

87. The Discharger provides treatment and control of the Hydraulics Lab discharge that incorporates:

    a. No chemical amendments to the source water used for hydraulic experiments without fish;

    b. Treatment of the fish recirculation water to maintain a healthy environment for the fish; and

    c. Adding minimal chemical amendments to the source water during fish experiments to maintain a healthy environment.

88. The Board finds that the treatment and control measures described above may be considered “BPTC” for this discharge. This Order also establishes operational requirements, limitations, and prohibitions that will ensure that the discharge will not unreasonably affect present and anticipated beneficial uses of groundwater or result in groundwater quality less that that prescribed in state and regional policies.

Other Regulatory Considerations

89. In compliance with Water Code section 106.3, it is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This order promotes that policy by requiring discharges to meet maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

90. Based on the threat and complexity of the discharge, the North Fork Discharge Area is determined to be classified as 3C as defined below:

    a. Category 3 threat to water quality: "Those discharges of waste that could degrade water quality without violating water quality objectives, or could cause a minor impairment of designated beneficial uses as compared with Category 1 and Category 2."

    b. Category C complexity, defined as: "Any discharger for which waste discharge requirements have been prescribed pursuant to Section 13263 of the Water Code not included in Category A or Category B as described above. Included are dischargers having no waste treatment systems or that must comply with best management practices, dischargers having passive treatment and disposal systems, or dischargers having waste storage systems with land disposal."

91. Title 27 of the California Code of Regulations (hereafter Title 27) contains regulatory requirements for the treatment, storage, processing, and disposal of solid waste. However, Title 27 exempts certain activities from its provisions. Discharges regulated by this Order are exempt from Title 27 pursuant to provisions that exempt domestic sewage, wastewater, and reuse. Title 27, section 20090 states in part:

    The following activities shall be exempt from the SWRCB-promulgated provisions of this subdivision, so long as the activity meets, and continues to meet, all preconditions listed:

    (a) Sewage - Discharges of domestic sewage or treated effluent which are regulated by WDRs issued pursuant to Chapter 9, Division 3, Title 23 of this code, or for which WDRs have been waived, and which are consistent with applicable water quality objectives, and treatment or storage facilities associated with municipal wastewater treatment plants, provided that residual sludges or solid waste from wastewater treatment facilities shall be discharged only in accordance with the applicable SWRCB-promulgated provisions of this division.

    (b) Wastewater - Discharges of wastewater to land, including but not limited to evaporation ponds, percolation ponds, or subsurface leachfields if the following conditions are met:

        (1) the applicable RWQCB has issued WDRs, reclamation requirements, or waived such issuance;

        (2) the discharge is in compliance with the applicable water quality control plan; and

        (3) the wastewater does not need to be managed according to Chapter 11, Division 4.5, Title 22 of this code as a hazardous waste.

92. The discharge authorized herein, and the treatment and storage facilities associated with the discharge, are exempt from the requirements of Title 27 as follows:

    a. Discharges to Ponds 1 and 2, the Hydraulics Lab Retention Basin 1, and the North and South Basin of the North Fork Cutoff are exempt pursuant to Title 27, section 20090(b) because they are discharge of wastewater to land and:

        i. The Central Valley Water Board is issuing WDRs.

        ii. The discharge is in compliance with the Basin Plan, and;

        iii. The treated effluent discharged to the ponds does not need to be managed as hazardous waste.

93. Water Code section 13267(b)(1) states:

    In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region … shall furnish, under penalty of perjury, technical or monitoring program reports which the board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

    The technical reports required by this Order and the attached Monitoring and Reporting Program R5-2016-0099 are necessary to ensure compliance with these waste discharge requirements. The Discharger owns and operates the North Fork Discharge Area that discharges the waste subject to this Order.

94. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981). These standards, and any more stringent standards adopted by the state or county pursuant to Water Code section 13801, apply to all monitoring wells used to monitor the impacts of wastewater storage or disposal governed by this Order.

95. The Discharger evaluated the potentially significant environmental effects due to the construction and operation of the new fish recirculation system in accordance with the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). On 7 December 2015, the Discharger certified a Notice of Exemption that found the project to be categorically exempt under class 3 for new construction of small structures.

96. Aside from the new fish recirculation system, all components of the facilities were existing at the time the Board undertook its environmental review of these WDRs. The action of prescribing these WDRs, which impose regulatory requirements on the existing discharge in order to ensure the protection of groundwater resources, is therefore exempt from the provisions of CEQA in accordance with California Code of Regulations, title 14, section 15301, which exempts the "operation, repair, maintenance, [and] permitting … of existing public or private structures, facilities, mechanical equipment, or topographical features" from environmental review.

97. Pursuant to Water Code section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

Public Notice

98. All the above and the supplemental information and details in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge.

99. The Discharger and interested agencies and persons have been notified of the Central Valley Water Board's intent to prescribe waste discharge requirements for this discharge, and they have been provided an opportunity to submit written comments and an opportunity for a public hearing.

100. All comments pertaining to the discharge were heard and considered in a public hearing.

IT IS HEREBY ORDERED that Order R5-2015-0137 is rescinded and, pursuant to Water Code sections 13263 and 13267, the University of California, Davis, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the Water Code and regulations adopted hereunder, shall comply with the following:

A. Discharge Prohibitions

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Discharge of waste classified as 'hazardous', as defined in the California Code of Regulations, title 23, section 2510 et seq., is prohibited.

3. Discharge of waste classified as 'designated', as defined in Water Code section 13173, in a manner that causes violation of groundwater limitations, is prohibited.

4. Discharge of waste at a location or in a manner different from that described in the Findings is prohibited.

5. Discharge to the North Basin from the CABA Aquatic Center is prohibited until the Discharger submits the *Flow Meter and Sampling Port Installation Report* as described in the Provisions of this Order.

6. The discharge of toxic substances into the wastewater ponds or basins is prohibited.

7. Discharge of wastewater containing experimental waste into the septic systems is prohibited.

8. Discharge of domestic waste to anything other than septic system or regularly serviced portable toilets is prohibited.

9. Discharge of anything other than domestic wastewater to the septic tank and leach field system is prohibited.

B. Flow Limitations

1. **Effectively immediately**, wastewater discharge to the following discharge areas shall not exceed the specified flow limits shown below. The total annual flow limit is determined by the total flow for the calendar year.

Discharge Area	Total Annual Flow Limit
South Basin	60 MG
North Basin	592 MG
Isolation Pond	33.5 MG

2. **Effectively immediately**, wastewater discharge to the Hydraulic Lab Retention Basin 1 shall comply with the following limitations:
   a. Not exceed 126,000 gallons during a single discharge event,
   b. Not occur 24-hours prior to a forecasted storm event, and
   c. Not occur when ponding water is visible.

3. **Effective on the date of the Executive Officer's approval** of a *Hydrogeological Capacity Evaluation Report* submitted pursuant to Provision F.1.e, the total annual flow to the South Basin greater than 60 MG will be allowed, with incremental increases up to a maximum annual flow not to exceed 400 MG. Any incremental flow increases will be granted upon Executive Officer's approval of the report.

C. Effluent Limitations

1. Wastewater discharged to the Aquatic Weed Lab Pond 1, Hydraulics Lab Retention Basin 1, Jamison Pond, Isolation Pond, North Basin, and South Basin shall not

exceed the following effluent limits. Compliance shall be determined based on the effluent sampling locations depicted in Attachments C, D, and E.

Constituent	Units	Monthly Maximum	Monthly Average
Average TDS Concentration [1]	mg/L	--	630
Total Nitrogen Concentration [2]	mg/L	12	--

[1] Flow-weighted average based on total flow and concentration for each source of water discharged.

[2] The total nitrogen effluent limit does not apply to batch flows from the Hydraulic Lab.

2. Wastewater discharged from the Aquatic Weed Lab storage tanks (see Attachment E) shall not exceed the following effluent limits:

Herbicide Trade Name	Active Ingredient	Effluent Limit (µg/L)
Weedar 64	2,4-Dichlorophenoxyacetic acid	5
Tradewind	Bispyribac-sodium	0.5
Stingray	Carfentrazone-ethyl	0.01
Cutrine Plus	Elemental copper	200
Reward	Diquat dibromide	4
Aquathol K	Endothall	45
Clipper	Flumioxazin	0.01
Sonar AS	Fluridone	1
Rodeo	Glyphosate	5
Clearcast	Imazamox	0.5
Habitat	Imazapyr	0.5
Galleon	Penoxsulam	1
Renovate 3	Triclopyr	0.1

3. Compliance with the above requirements shall be determined as specified in the Monitoring and Reporting Program.

D. Discharge Specifications

1. No waste constituent shall be released, discharged, or placed where it will cause a violation of the Groundwater Limitations of this Order.

2. Wastewater treatment, storage, and disposal shall not cause pollution or a nuisance as defined by Water Code section 13050.

3. The discharge shall remain within the permitted wastewater treatment and containment structures at all times.

4. The Discharger shall operate all systems and equipment to optimize the quality of the discharge.

5. All conveyance, treatment, storage, and disposal systems shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

6. The Discharger shall operate and maintain all ponds sufficiently to protect the integrity of containment dams and berms and prevent overtopping and/or structural failure. Unless a California-registered civil engineer certifies (based on design, construction, and conditions of operation and maintenance) that less freeboard is adequate, the operating freeboard in any pond shall never be less than two feet (measured vertically from the lowest possible point of overflow). As a means of management and to discern compliance with this requirement, the Discharger shall install and maintain in each pond a permanent staff gauge with calibration marks that clearly show the water level at design capacity and enable determination of available operational freeboard.

7. Wastewater treatment, storage, and disposal ponds or structures shall have sufficient capacity to accommodate allowable wastewater flow, design seasonal precipitation, and ancillary inflow and infiltration during the winter while ensuring continuous compliance with all requirements of this Order. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.

8. On or about **1 October** of each year, available capacity shall at least equal the volume necessary to comply with Discharge Specifications D.6 and D.7.

9. All ponds and open containment structures shall be managed to prevent breeding of mosquitoes. Specifically:

    a. An erosion control program shall be implemented to ensure that small coves and irregularities are not created around the perimeter of the water surface.

    b. Dead algae, vegetation, and debris shall not accumulate on the water surface.

c. The Discharger shall consult and coordinate with the local Mosquito Abatement District to minimize the potential for mosquito breeding as needed to supplement the above measures.

10. Newly constructed or rehabilitated berms or levees (excluding internal berms that separate ponds or control the flow of water within a pond) shall be designed and constructed under the supervision of a California Registered Civil Engineer.

11. Wastewater contained in any unlined pond shall not have a pH less than 6.0 or greater than 9.0.

12. If wastewater is present in the Aquatic Weed Lab evaporation tank's secondary containment structure, the evaporation tanks shall be emptied and inspected for leaks. All leaks shall be fixed prior to putting the evaporation tanks back in service. All wastewater collected while the evaporation tanks are out of service shall be stored in an impermeable container or disposed of at a permitted wastewater disposal facility capable of treating the waste.

E. Groundwater Limitations

Release of waste constituents from any portion of the North Fork Discharge Area shall not cause groundwater to:

1. Exhibit a pH of less than 6.5 or greater than 8.4 pH units.

2. Contain taste or odor-producing constituents, toxic substances, or any other constituents in concentrations that cause nuisance or adversely affect beneficial uses.

F. Provisions

1. The following reports shall be submitted pursuant to Water Code section 13267 and shall be prepared as described in Provision F.3:

   a. By **1 February 2017**, the Discharger shall submit a *Sampling and Analysis Plan* (SAP). The SAP shall describe specific sampling procedures for all samples required to be collected by the Monitoring and Reporting Program (MRP), including groundwater samples. The SAP shall also describe the procedure and schedule for calibration of field test instruments, such as pH and DO meters. The SAP shall document that dissolved oxygen shall be measured in situ (i.e., probes shall be lowered into the wastewater). The SAP shall also contain a discussion of the sampling location for each pond. Samples shall be collected at a location that complies with the MRP (i.e., at a depth of one foot, opposite the inlet) or as clarified in this Order. As required by the MRP, field

calibration documentation for all field test instruments shall be submitted with the monthly monitoring reports.

b. **By 1 March 2017**, the Discharger shall submit a *Groundwater Limitations Compliance Assessment Plan*. The plan shall describe and justify the statistical methods used to propose groundwater concentration limits and compliance for the constituents listed in the Monitoring and Reporting Program. Compliance shall be determined annually based on an interwell statistical analysis that uses methods prescribed in Title 27, section 20415(e)(7) and (8) to compare monitoring data collected at each down gradient well to background groundwater quality as measured in GW-003.

c. At least **90 days** prior to discharging wastewater containing herbicides not regulated by the California Department of Pesticide Regulation, the Discharger shall submit an *Herbicide Evaluation Report* that evaluates if the active ingredients have the potential to impact surface water or groundwater quality. The report shall provide the evaluation protocol used for the determination, provide evidence of consultation with the Solano County Agricultural Commissioner, and state how the herbicide use will comply with UCD safety and experimental procedures.

The report shall propose a reporting limit and effluent limit using the most sensitive calibration standard. The proposed effluent limit shall be based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to determine the effluent limit depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to compute the effluent limit from the reporting limit. Upon the Executive Officer's written approval, discharge of the herbicide containing wastewater may occur.

d. At least **90 days** prior to the CABA Aquatic Center discharging to the North Basin of the North Fork, the Discharger shall submit a *Flow Meter and Sampling Port Installation Report*. The report shall certify that a flow meter and sample port were installed, describe the type of flow meter, indicate the installation location on a scaled map, and describe which wastewater streams are plumbed to be discharged through the flow meter.

e. **At least 180 days** prior to any planned increase in influent flow to the South Basin, the Discharger shall submit a *Hydrogeological Capacity Evaluation Report* prepared by a licensed professional Geologist or Hydrogeologist. The report shall propose a flow limit not to exceed 400 MG and provide technical justification including a water balance and discussion of the hydrogeological

capacity of the discharge area. At a minimum, the report shall include a discussion on the storage capacity of the shallow aquifer, efforts that will be taken to minimize mounding, any affects to local hydraulic gradients, potential for horizontal mobilization of constituents of concern away from the discharge area, available vadose zone reduction which may decrease the removal of certain pollutants, and efforts to prevent indirect discharge to Putah Creek. Any incremental flow increases will be granted upon Executive Officer's approval of the report.

f. **At least 180 days** prior to any planned UV light disinfection system installation, the Discharger shall submit a *UV Light Disinfection System Installation Workplan* for approval by the Executive Officer. The workplan shall provide a description of the proposed system, including design parameters (i.e. flow capacity and UV transmittance); an updated process flow diagram if applicable; and a time schedule for the installation of the UV light disinfection system. If the Discharger proposes to decommission the existing disinfection system, the workplan shall include a time schedule for the decommissioning activities.

Upon 60 days following completion of these activities, the Discharger shall submit *a UV Light Disinfection Installation Completion Report* certifying the installation of the UV system is complete and fully operational. If the installation workplan proposed decommissioning the existing disinfection system, then the completion report shall certify that those activities were complete. Following review of this report, the WDRs will be amended, if necessary, to reflect the current disinfection technology performed at the three facilities.

2. A discharger whose waste flow has been increasing, or is projected to increase, shall estimate when flows will reach hydraulic and treatment capacities of its treatment, collection, and disposal facilities. The projections shall be made in January, based on the last three years' average dry weather flows, peak wet weather flows and total annual flows, as appropriate. When any projection shows that capacity of any part of the facilities may be exceeded in four years, the discharger shall notify the Central Valley Water Board by **31 January**.

3. In accordance with California Business and Professions Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain workplans for investigations and studies, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. Each technical report submitted by the Discharger shall bear the professional's signature and stamp.

4. The Discharger shall submit the technical reports and work plans required by this Order for consideration by the Executive Officer, and incorporate comments the Executive Officer may have in a timely manner, as appropriate. Unless expressly stated otherwise in this Order, the Discharger shall proceed with all work required by the foregoing provisions by the due dates specified.

5. The Discharger shall comply with Monitoring and Reporting Program R5-2016-0099, which is part of this Order, and any revisions thereto as ordered by the Executive Officer. The submittal dates of Discharger self-monitoring reports shall be no later than the submittal date specified in the MRP.

6. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which are attached hereto and made part of this Order by reference. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

7. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports. On or before each report due date, the Discharger shall submit the specified document to the Central Valley Water Board or, if appropriate, a written report detailing compliance or noncompliance with the specific schedule date and task. If noncompliance is being reported, then the Discharger shall state the reasons for such noncompliance and provide an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Central Valley Water Board in writing when it returns to compliance with the time schedule. Violations may result in enforcement action, including Central Valley Water Board or court orders requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

8. The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by the Discharger when the operation is necessary to achieve compliance with the conditions of this Order.

9. The Discharger shall use the best practicable cost-effective control technique(s) including proper operation and maintenance, to comply with this Order.

10. As described in the Standard Provisions, the Discharger shall report promptly to the Central Valley Water Board any material change or proposed change in the character, location, or volume of the discharge.

11. The Discharger shall not allow pollutant-free wastewater to be discharged into the wastewater collection, treatment, and disposal systems in amounts that significantly diminish the system's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants.

12. At least **90 days** prior to termination or expiration of any lease, contract, or agreement involving disposal or recycling areas or off-site reuse of effluent, used to justify the capacity authorized herein and assure compliance with this Order, the Discharger shall notify the Central Valley Water Board in writing of the situation and of what measures have been taken or are being taken to assure full compliance with this Order.

13. In the event of any change in control or ownership of the North Fork Discharge Area, the Discharger must notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to the Central Valley Water Board.

14. To assume operation as Discharger under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the state of incorporation if a corporation, the name and address and telephone number of the persons responsible for contact with the Central Valley Water Board, and a statement. The statement shall comply with the signatory paragraph of Standard Provision B.3 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the Water Code. If approved by the Executive Officer, the transfer request will be submitted to the Central Valley Water Board for its consideration of transferring the ownership of this Order at one of its regularly scheduled meetings.

15. A copy of this Order including the MRP, Information Sheet, Attachments, and Standard Provisions, shall be kept at each discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

16. The Central Valley Water Board will review this Order periodically and will revise requirements when necessary.

If, in the opinion of the Executive Officer, the Discharger fails to comply with the provisions of this Order, the Executive Officer may refer this matter to the Attorney General for judicial enforcement, may issue a complaint for administrative civil liability, or may take other enforcement actions. Failure to comply with this Order may result in the assessment of Administrative Civil Liability of up to $10,000 per violation, per day, depending on the violation, pursuant to the Water Code, including sections 13268, 13350 and 13385. The

Central Valley Water Board reserves its right to take any enforcement actions authorized by law.

Any person aggrieved by this action of the Central Valley Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Water Board's webpage for Public Notices (http://www.waterboards.ca.gov/public_notices/petitions/water_quality) or will be provided upon request.

I, PATRICK PULUPA, Executive Officer, do hereby certify that the foregoing is a full true, and correct copy of an Order adopted by the California Regional Water Quality Control Board on 6 December 2016 and amended on 4 June 2020.

Patrick Pulupa
Digitally signed by Patrick Pulupa
Date: 2020.06.29 15:44:33 -07'00'
Water Boards

PATRICK PULUPA, Executive Officer