

AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 106 P.O. Box 1510 Tempe, Arizona 85281 Phone: (480) 921-8044 • Fax: (480) 921-0049

Lic. No. AZ0003

26 November 2019

Ms. Debbie Tribioli
The Oasis at Anozira
c/o Kinney Management Services
6303 South Rural Road
Tempe, Arizona 85283

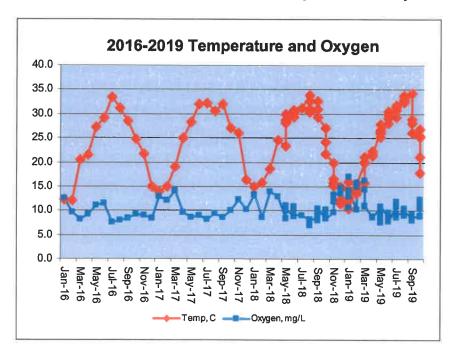
Ref: Oasis Lake, October 2019

Dear Ms. Tribioli:

The following report summarizes water quality data collected for Oasis Lake on 06 October 2019. Similar data have been reported each month and are used in this report to generate the graphs that are used for tracking changes in water quality. The report includes field data sheets summarizing weekly lake and mechanical system conditions during the month.

Chemical and Physical Composition

Temperature, Oxygen, and pH: Water temperature decreased to 19.4 C (67 F) and the dissolved oxygen concentration remained over 100 percent saturation (12.4 mg/L). Operation of the floating fountains, as well as the trial nanobubble oxygenation system, helped maintain dissolved oxygen at a level that was more than satisfactory for the fishery.

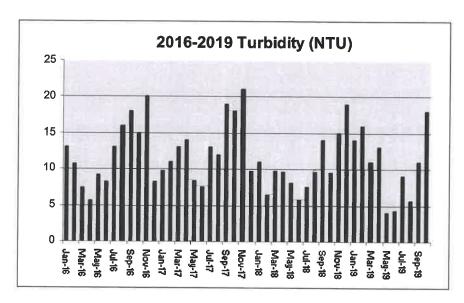


The table below shows the USEPA criteria for dissolved oxygen in warm water fisheries.

Criterion	Early life stages	Other life stages
Daily mean	>6.0	>4.0
Daily minimum	>5.0	>3.0

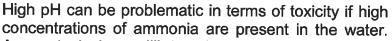
Water temperature tolerance varies among fish species. However, the maximum weekly temperature tolerance of most common urban lake fish species is 32 to 35 C.

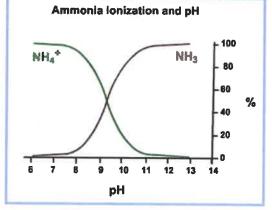
Turbidity: The turbidity of the lake water increased to 17 NTU. Water turbidity is impacted by algae density and dissolved and particulate matter in the water, including storm water runoff and dye that is periodically added for algae and weed management. As turbidity increases, clarity decreases.



pH: The lake water pH varied from 8.9 to 9.3 SU during the month. Water pH is influenced by the chemical makeup of the water and the amount of algae in the lake. In a very simplified explanation for the role of algae, carbonic acid in the water is formed from dissolution of carbon dioxide. Carbonic acid tends to make the water more acidic and pH decreases.

However, algae utilize carbon dioxide during photosynthesis during daylight, making less carbon dioxide available to form carbonic acid, and pH increases. The more algae present, the greater the increase in pH that usually occurs. Data indicate that pH increased despite decreasing water temperatures and reduced algae growth during the month. Therefore, pH changes may have resulted from a difference in SRP canal feed water composition.



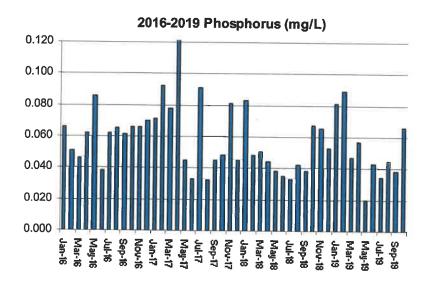


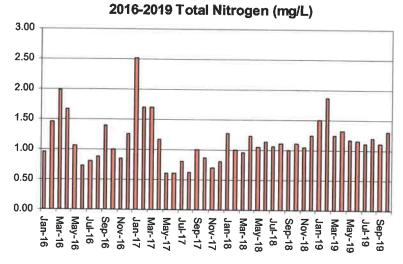
Ammonia is in equilibrium between two forms; ammonium ion and ammonia gas. At pH

concentrations above 9.0 SU and a water temperature increases, ammonia converts to the gas which is toxic to many aquatic organisms. At the measured water temperatures, measured pH values would not result in toxicity. No signs of fish stress were observed.

Nutrients: Nitrogen and phosphorus are the primary nutrients that stimulate algae and submerged plant growth. Phosphorus is typically the nutrient that dictates how much plant growth can be sustained in a lake. Usually if the total phosphorus concentration is below 0.030 mg/L, low levels of suspended algae occur. A nitrogen concentration of about 10 times the phosphorus (0.30 m/L) is typically needed to support algal growth.

The phosphorus concentration increased to 0.068 mg/L as P. The total nitrogen concentration also increased slightly to 1.30 mg/L as N. Nitrate, immediately available to algal cells, was at a concentration of <0.05 mg/L. Usually a change in nutrient concentrations is reflected in changes in algae growth and density. However, a decrease in algae density occurred. Decreased sunlight intensity and water temperature likely had a greater impact on algae response than nutrient concentrations.

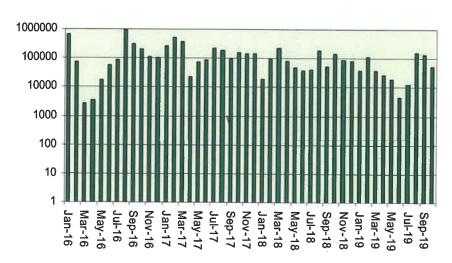




Biological Composition

Phytoplankton (algae): The amount and types of algae in a lake dictate the aesthetic and operational quality of the water. Algae density affects the clarity and color of the water, two very important aesthetic criteria. The species composition dictates the form of growth observed; floating mats, suspended cells, stringy attached filaments, etc. It also impacts the choice, frequency, and dosage of herbicides used for water quality management.

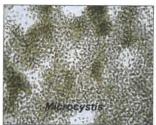




The total algae density in the lake decreased to 5.02 x 10⁴ cells per mL, a density considered moderate for an urban reservoir in metro-Phoenix. Blue-green (Cyanophyta) filamentous and colonial algae, *Cylindrospermopsis*, *Oscillatoria*, and *Microcystis*, were the dominant forms. Although *Cylindrospermopsis* can be a toxin former and has been linked to fish kills in some states, it has not been associated with loss of fish in Arizona lakes. *Oscillatoria* can form stringers along the lake edge, bottom growths, or floating mats. However, only minor edge growth was observed. *Microcystis* can form downwind scum or cause turbidity in the water (as occurred during the month). Lake dye was added during the month to help manage algae growth.







Tests conducted through the month indicated no presence of golden algae. The golden alga (*Prymnesium parvum*), produces toxins that rupture unprotected cells. The toxin release is believed to benefit golden algae by killing other species of algae, thereby making resources (nutrients) more available to the golden algae population.



Unfortunately, the cells of fish gills are also unprotected because that is where oxygen absorption occurs. Thus, the toxin also results in asphyxiation of fish. Susceptibility to the toxin varies amongst fish species.

Midge flies: Midge flies are common inhabitants of most lakes. Adult females lay hundreds of eggs on the water surface. The eggs settle to the lake bottom and hatch in a few days. Larvae develop and grow in the superficial sediments over a three to four week period. In about 30 days the insect larvae become pupae, rise in the water column, and emerge as adult flies. The life cycle is shown diagrammatically below. Adults tend to swarm at dusk and dawn and become a nuisance. They fly into residents' eyes and mouths, congregate under eaves of houses, and leave a sticky messy residue when they die. Management techniques may include stocking of bottom-feeding fishes to consume the larvae and/or application of bacterial or chemical larvicides. Because these fish have not been stocked for three years or more, a maintenance stocking of goldfish or sunfish is recommended for spring 2020.







Few adult midge flies were detected during the month.

Fishery: No significant loss of fish occurred during the month.

Waterfowl: Ducks and geese can be a beautiful sight on a small urban pond or lake. They seem to make the lake look more like a natural lake than an artificial reservoir. They are fascinating creatures. However, when ducks and geese become too numerous, several lake management and aesthetic problems can develop. These problems are listed below.

- Bird wastes are unattractive and cause slippery conditions.
- Cleaning waste from sidewalks and turf is an additional maintenance item.
- Geese and other waterfowl can become aggressive toward humans.
- Waterfowl can damage turf areas.
- Waterfowl add nitrogen and phosphorus to the water.
- Bird wastes contain bacteria that are a health risk to humans and pets.
- Diving birds consume fish that are stocked in the lack for management purposes.





Arizona Game and Fish Department has developed criteria for waterfowl on small urban lakes (see table). Based on the Arizona Game & Fish Department scale, the lake condition in terms of waterfowl has been in the "excellent" category. Cormorants and Canada geese were rarely observed during the month. Cormorants are diving birds that feed on small fish. Canada geese destroy turf and, along with other birds, contribute fecal matter to the common areas and water.

Ranking	Waterfowl Density
Excellent	<3/acre
Good	3-4/acre
Fair	5-6/acre
Poor	>6/acre

Bacteria

In terms of public health protection, the *E. coli* bacteria concentration was relatively high (166 per 100 mL), but met incidental (partial body contact) and full body contact recreational standards (maximum of 235 and 575 per 100 mL, respectively).

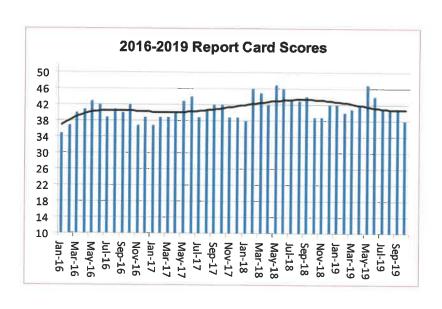
Mechanical Systems and Field Observations

Weekly field inspection forms are attached to this report. The nanobubble aeration system had an electrical fault alarm during the month and was taken out of service. A replacement unit was being installed. An endothall-based algaecide was applied weekly to the three entry fountains. A peroxide-based algaecide was also used.

Lake Report Card

The water quality data are summarized on the attached Oasis Lake Report Card. Each salient parameter has been qualitatively evaluated and then assigned a numeric value for quantitative comparison and tracking purposes. The September score was 41, identical to that off July and August.

Report card scores for the past three years have been graphically summarized below. Polynomial regression analysis still indicates a somewhat cyclic pattern and a long-term overall increasing trend in score.



Respectfully,

AQUATIC CONSULTING & TESTING, INC.

Frederick A. Amalfi, Ph.D., C.L.M.

Laboratory Director





LABORATORY REPORTS



FIELD INSPECTION FORMS



PESTICIDE APPLICATION DOCUMENTS



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1525 W. University Drive, Suite 106 P.O. Box 1510 Tempe, Arizona 85281

Phone: (480) 921-8044 • Fax: (480) 921-0049

Lic. No. AZ0003

MPN/100 mL

NTU

LABORATORY REPORT

Client: Oasis at Anozira

c/o Kinney Management Services

6303 S. Rural Road Tempe, Arizona 85283

Attn: Debbie Tribioli

Client ID: Lake

E. coli, Colilert

Turbidity

Date Submitted: 10/02/19

Date Reported: 11/27/19

43

18.

Project: Monthly Lake Monitoring

Sample Type: Surface Water

SM 9223 B

180.1

RESULTS

ACT Lab No.: CB08836	Sample Time: 10/02/19 10:30							
	Analys	is Date						
Parameter	<u>Start</u>	<u>End</u>	Method No.	Result	_Unit_			
Algae Count	10/30/19	10/30/19	SM 10200 F	See Attached	cells/mL			
Algae Identification	10/30/19	10/30/19		See Attached				
Oxygen, Dissolved Field	10/02/19	10/02/19	SM4500 O G	9.1	mg/L as O2			
pH, Field	10/02/19	10/02/19	SM4500H+ B	9.0	SU			
Temperature, Field	10/02/19	10/02/19	SM2550 B	26.9	С			
Nitrate + Nitrite - N	10/28/19	10/28/19	SM4500NO3 E	< 0.05	mg/L as N			
Phosphorus, Total	10/28/19	10/29/19	365.3	0.068	mg/L as P			
Total Kjeldahl Nitrogen	10/07/19	10/07/19	SMNorg C,NH3 C/D	1.3	mg/L as N			

10/02/19 10/03/19

10/02/19 10/02/19

Reviewed by:

Frederick A. Amalfi, Ph.D **Laboratory Director**

ALGAE IDENTIFICATION

AC&T Lab No.	CB08836	Date Collected	10/02/19	
Client I.D.	Oasis	Collected By	AC&T	

Divisions: bac=Bacillariophyta; chl=Chlorophyta; cry=Chrysophyta; cyn=Cyanophyta; eug=Euglenophyta; hap=Haptophyta; pyr=Pyrrhophyta

Forms: u=unicell; c=colony; f=filament; g= flagellate

	Div	Rel.	Total			Div	Rel.	Total	
Genus	Form	Count	per mL	Comp.	Genus	Form	Count	per mL.	Comp
Achnanthes	bac-u	11	222	0.44%	Microcystis	cyn-c	66	14660	29.20%
Anabaena	cyn-f	10	2221	4.42%	Microspora	chl-f			
Ankistrodesmus	chl-u				Mougeotia	chl-f			
Aphanocapsa	cyn-c				Navicula	bac-u	2	444	0.88%
Asterionella	bac-c				Nitzschia	bac-u			
Botryococcus	chl-c				Oocystis	chl-c	17	3776	7.52%
Carteria	chl-ug				Oscillatoria	cyn-f	85	18881	37.61%
Cephalomonas	chl-ug				Pandorina	chl-cg			
Ceratium	pyr-ug				Pediastrum	chl-c			
Chlamydomonas	chl-ug				Peridinium	pyr-ug			
Chlorella	chl-u	15	3332	6.64%	Phacotus	chl-ug			
Chlorococcum	chl-c				Phacus	chl-ug			
Chroococcus	cyn-c				Pinnularia	bac-u			
Chroomonas	crp-ug	1	222	0.44%	Pithophora	chl-f			
Closterium	chl-u				Prymnesium	hap-ug			
Cocconeis	bac-u				Rhizoclonium	chl-f			
Coelastrum	chl-c				Rhoicosphenia	bac-u			
Cosmarium	chl-u				Rhopalodia	bac-u			
Cosmocladium	chl-c				Scenedesmus	chl-c	4	888	1.77%
Crucigenia	chl-c				Scytonema	chl-f			1.7770
Cryptomonas	crp-ug				Selanastrum	chl-u			
Cyclotella	bac-u				Sphaerocystis	chl-c			
Cylindrospermopsis	cyn-f	25	5553	11.06%	Spondylumorum	chl-c			
Diatoma	bac-u				Spirulina	cyn-f			
Dinobryon	bac-c				Staurastrum	chl-u			
Dunaliella	chl-u				Stephanodiscus	bac-u			
Epithemia	bac-u				Stigeoclonium	chl-f			
Euglena	eug-ug				Surirella	bac-u			
Fragilaria	bac-u				Synechococcus	cyn-u			
Frustulia	bac-u				Synechocystis	cyn-c			
Glenodinium	pyr-ug				Synedra	bac-u			
Golenkinia	chl-c				Synura	cry-cg			
Gomphonema	bac-u				Tetraedron	chl-u			
Gonium	chl-cg				Tetrastrum	chl-c			
Gonyaulax	pyr-ug				Trachelomonas	eug-ug			
Gyrosigma	bac-u				Vaucheria	chl-f			
Hydrodictyon	chl-c				Volvox	chl-cg			
yngbya	cyn-f				Zygnema	chl-f			
Melosira	bac-f				7.3	GIII I			
Meridion	bac-u								
Merismopedia	cyn-c								

_____ check 100.00%

Aquatic Consulting & Testing, Inc. 1525 W. University Dr., Suite 106 Tempe, Arizona 85281

Count (cells/mL)_	5.02E+04

1019

OASIS LAKE REPORT CARD

SCORE 38	SCORE 41
Oct-19 CONDITION GOOD	Sep-19 CONDITION GOOD
ALUATION:	VALUATION:
DATE OF EVALUATION	PREVIOUS EVALUATION:

			4 pts	3 pts	2 pts	1 pt	
CONDITION	RESULT	RATIONALE	EXCELLENT	G005	FAIR	POOR	SCORE
Turbidity (NTU)	18.0	aesthetics	6 >	5-10	11-20	>20	2
Dissolved oxygen (mg/L)	>7	aquatic life, sediment nutrient release, odors	>7.0	5.6-6.9	4.0-5.5	<4.0	4
Nitrogen, total (mg/L)	1.30	algae and macrophyte growth	<0.5	0.5-1.0	1.1-2.0	>2.0	2
Phosphorus, total (mg/L)	0.066	algae and macrophyte growth	<0.03	0.03-0.05	0.06-0.10	>0.10	2
Algae density (no./mL)	5.02 x 10 ⁴	aesthetics	<5 × 10 ⁴	5x10 ⁴ - 9x10 ⁴	1 x 10 ⁵ -5x 10 ⁶	>5 x 10 ⁵	8
Algae form (dominant)	bluegreen filament	aesthetics, treatability	greens; no floating mats	diatoms; no floating mats	blue-greens; no floating mats	blue-greens; floating mats common	2
Macrophytes (% cover)	₹	aesthetics, boating	попе	<10%	11-20%	>20%	4
pH (SU) avg.	6.8	swimming, fishery, ammonia toxicity	6.5-8.0	8.0-8.5	8.6-9.0	>9.0	2
E. coli bacteria (#/100 mL) avg.	166	public health protection	<20	21-80	81-125	>125	1
Midge flies	no nuisances	quality of life	no nuisances	minor nuisances	moderate nuisances	significant nuisances	4
Waterfowl (no. per acre)	-	nutrient and bacteria loading	<2	2-5	6-10	>10	4
Fishery	normal	recreation, aesthetics	no fish piping; no fish kills	some fish piping, gulping; no fish kills	fish piping before dawn; occasional fish kills	fish piping common; fish kills common	4
Shoreline/banks	limited edge growths	aesthetics	no evidence of salt crusts or algal scums	some white deposits and scums	numerous patches of salt deposits and algae scums	most of lake shore covered with crusts or scums	4

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Poor	<30
Fair	30-35
500d	36-41
Excellent	42-48

Definitions: Ratings

Excellent: Lake aesthetic and operational conditions above level of expectation. Good: Lake aesthetic and operational conditions at le level of expectation. Fair: Lake aesthetic and operational conditions slightly below level of expectation. Poor: Lake aesthetic and operational conditions considerably below level of expectation.

Definitions: Terms

pH: -log hydrogen ion conc.; amount of acid in the water identified on scale 1-14; 1 being most acid, 7 neutral, and 14 being most caustic. Piping: Act of fish coming to surface of water and capturing a bubble of air in their mouth; a sign of low oxygen concentrations. N/A: not applicable; insufficient data or too early in development of lake (an arbitrary 3 rating is provided for these items). Macrophyte: Large plant, observable without the aid of a microscope, that may be floating, submerged or emergent. Midge: Small, flying, non-biting "gnat-like" insect whose larval stage exists in the lake sediments (bloodworm) Phytoplankton (algae): Microscopic plant fraction of the plankton community.

Plankton: Organisms of relatively small size that have relatively small powers of locomotion or that drift in the water. Turbidity: Degree to which particles and color in the water scatter light; the "cloudiness" of the water.

OASIS AT ANOZIRA FIELD INSPECTION FORM

Date: 10 2 By:	10	wpdoc/lists&forms)		
Aeration System		Lake Su	rface	
operational		□ Lake s	urface cleaning	
Details:				
Floating Fountai	ns & West - East & So	uth		,
perational p	Problem Details:			
Pump house				
Compressors	operational o Prob	lem Details:		
Pumps	operational o Prob	lem Details:		
Entry Fountains				1
Elliot North: 🗆 -0	perational Screens clear	red 🗆 Problem D	etails: Hydrothol	Phyconyci
Elliot South:	perational Screens clear	ed 🗆 Problem D	etails:	
Los Feliz:	perational Screens cleare	ed 🗆 Problem De	etails:	
Monthly Chemistry	y & Biology		A Phylips II	
Dissolved oxyger Temperature DH Algae ID and cou	26.9	N.	16 位 利用 15 mm 15	enie
Ørganic N (TKN)	W			DUP
☐ Phosphorus ☐ Turbidity		s	A PARTY OF THE PAR	
□/E. coli				
□ Golden algae (sea	asonal)			A Property of the Control of the Con

OASIS AT ANOZIRA FIELD INSPECTION FORM

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Date: 10-9-19 By: 44			·		
Aeration System	1 Operation		Lake Surface	;	
operational 🗆	Problem		□ Lake surfac	e cleaning	
Details:					
	ns - West - East				
perational =	Problem Details: _				
Pump house	nousekeeping	∣ □ leaks □ ve	ntilation	ting Notes	
Compressors	operational c	□ Problem Deta	ails: <u>Ca</u>	<i>50</i>	
Pumps					
Entry Fountains					1 1
Elliot North:	perational - Screen	s cleared 🗆 P	roblem Details	: Hydrot	ho!
Elliot South: 🗆 🔊	perational d Screens	s cleared □ P	roblem Details	s:	
Los Feliz:	perational 🗹 Screens	s cleared □ P	roblem Details		
Monthly Chemistr	y & Biology			Way and the	**************************************
Dissolved oxyger Demperature DH Algae ID and cou Ammonia-N Dorganic N (TKN) Phosphorus Turbidity E. coli Golden algae (see	25.9 19.3 ant	W B		对时间	

OASIS AT ANOZIRA

Date:			
Acretica Scatter Co. 41			
Aeration System Operation Lake Surface			
□ operational → Problem □ Lake surface cleaning			
Details: Heration Deing repaired			
Floating Fountains West East South			
□ operational □ Problem Details:			
Pump house			
Compressors operational operational Details:			
Pumps			
Entry Fountains			
Elliot North: # operational Screens cleared Problem Details:			
Elliot South: operational of Screens cleared of Problem Details:			
Lea Faller			
Los Feliz: operational Screens cleared Problem Details:			
Monthly Chemistry & Biology			
Dissolved oxygen Temperature pH Algae ID and count			
□ Ammonia-N			
Organic N (TKN)			
□ Phosphorus s 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			





□ Turbidity



OASIS AT ANOZIRA

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1
ng Notes
eing Used
Hydrothol
:

□ E. coli

☐ Golden algae (seasonal)

OASIS AT ANOZIRA FIELD INSPECTION FORM

FIELD INSPECTION FORM (
Date: (0/30/19 By:
Aeration System Operation Lake Surface
Details: Hevation System Repaire
Floating Fountains - West - East - South
operational operat
Pump house housekeeping 🗆 leaks 🗆 ventilation 🗖 lighting Notes
Compressors operational operational Details: All in Use
Pumps operational Details:
Entry Fountains
Elliot North: Deperational Department of Screens cleared Problem Details:
Elliot South: poperational Screens cleared Problem Details:
Los Feliz: poperational poperat
Monthly Chemistry & Biology
Temperature pH Algae ID and count Ammonia-N Organic N (TKN) Phosphorus Turbidity E. coli Golden algae (seasonal)



AQUATIC CONSULTING & TESTING, INC. 1525 West University Drive, Suite 106

Tempe, Arizona 85281

Phone: 480-921-8044 Fax 480-921-0049

PESTICIDE TREATMENT NOTICE & RECORD

Client: The Oasis at Anozir	nozir	Αı	at	asis	O	The	lient:	C
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Attn: Debbie Tribioli

The Oasis at Anozira

C/O Kinney Management Services

6303 South Rural Road

Tempe, Az 85283

Location: Lake on Anozira Parkway		

Date: 10-10-19	Time: 7:30	Conditions: X clear	pt cloudy	overcast	
		cold	mild	<u>hot</u>	

Material:	Reg. No. (*restricted)	Tot. Qty:	Acres/Volume:
Pond Dye		5.0 gal	33 Aft
Target Pest: a	l dae	Degree of infestation	on:

Application method/calculations:

Maintenance dose

Dosage/rate Percent active ingredient: 26 % dye

Applicator: A. Murrett Cert. No. 061093

Remarks/follow-up:

Precautionary Statement:

Warning-Pesticides can be harmful. Keep children and pets away from pesticide applications until dry, dissipated, or aerated. For more information contact Aquatic Consulting & Testing, Inc. at 480-921-8044 and ask for Dr. Rick Amalfi. AC&T License No. 4418 F. A. Amalfi QP#1360 Cert. No. 900496



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Tempe, Arizona 85281

Phone: 480-921-8044 Fax 480-921-0049

PESTICIDE TREATMENT NOTICE & RECORD

Client: The Oasis at Anozira

Attn: Debbie Tribioli

The Oasis at Anozira

C/O Kinney Management Services

6303 South Rural Road

Tempe, Az 85283

Location:	Lake	Λn	Anazira	Parkway
Localion.	Lang	OH	Allozila	raikway

Date: 10-23-19	Time: 7:30	Conditions: X clear	pt cloudy	overcast	
		cold	mild	<u>hot</u>	

Material:	Reg. No. (*restricted)	Tot. Qty:	Acres/Volume:
Pond Dye		5.0 gal	33 Aft
Target Pest: a	lgae	Degree of infestation	on:

Application method/calculations:

Maintenance dose

Dosage/rate Percent active ingredient: 26 % dye

Applicator: A. Murrett Cert. No. 061093

Remarks/follow-up:

Precautionary Statement:

Warning-Pesticides can be harmful. Keep children and pets away from pesticide applications until dry, dissipated, or aerated. For more information contact Aquatic Consulting & Testing, Inc. at 480-921-8044 and ask for Dr. Rick Amalfi. AC&T License No. 4418 F. A. Amalfi QP#1360 Cert. No. 900496