Lakeside Lake Management Manual

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Introduction

Lakeside Lake is a 14 surface acre impoundment originally designed as a stormwater retention basin within Atterbury Wash (Fig. 1). The lake has a maximum depth of approximately 28 feet and a storage capacity of 197 acre-feet of water. The lake is lined with soil cement. The amount of sedimented material in the lake is currently unknown and, therefore, the exact storage capacity may deviate somewhat from the previously mentioned 197 acre-feet. There is a large berm which divides the lake into north and south "bays". This berm was originally intended to act as a baffle to decrease velocity of in-coming water via Atterbury Wash thereby resulting in a large amount of sedimentation of suspended solids in the southern end of the lake. The southern bay is approximately 3-4 feet shallower than the northern bay. The lake also has a concrete shelf around its perimeter which extends into the lake approximately 6 feet.

Lakeside is located in an urbanized area and attracts several visitors on an annual basis. The lake is managed by Tucson Parks and Recreation Department. The lake is heavily recreated and has abundant facilities including picnic tables, a boating dock, ramadas, grills, etc. The lake sits in a depression surrounded by hard banks and turf grass.

Lakeside Lake is in the Urban Fisheries Program sponsored by the Arizona Game and Fish Department. Stocking of trout occurs during the winter months and channel catfish during the spring and summer. Stocking does not occur when water conditions are not conducive to their survival. This primarily occurs during mid-late summer when either dissolved oxygen levels are relatively low or pH levels elevated. Other species of fish are found within the lake including mosquitofish, sunfish of various kinds (green sunfish and bluegill), and even goldfish. These fish are in the lake due to "incidental release" and are not part of any organized stocking program.

Atterbury Wash often contributes to water volume within the lake during intense, localized thunderstorm activity in the watershed. This water is often very turbid with very high levels of total suspended solids. Typical of drainages in the region, hydrographs are flashy with events usually lasting only a few hours but with large amounts of flow and velocity during any single event. Indeed, it is possible the entire lake volume is replaced during a heavy runoff event with water going over the spillway. There is likely a large amount of sedimentation within the lake due to these events but this has never been verified or quantified. This is in keeping with its nature as a stormwater retention basin and is actually what the "lake" was designed to do. In essence, Lakeside is being required to serve a dual role; one as a retention basin and the other as an urban lake and fishery. Often, these dual roles are in conflict.

When Atterbury Wash is not flowing and no water is exiting over the spillway, Lakeside has no outlet and primary water sources are from either a reclaimed water line or from non-potable (high nitrate) groundwater well (PK9). The PK9 well has only recently been used and the primary source until early 2006 was reclaimed water which was very high in total phosphorous and nitrogen, especially in organic and reduced forms of nitrogen (ammonia and organic forms). Besides the much larger oxygen demand of the reclaimed water, the organic and reduced forms of nitrogen, in addition to high levels of phosphorous, resulted in a very large algal biomass. The use of reclaimed water, with its very high levels of algal

nutrients, resulted in Lakeside being deemed "hyper-eutrophic". The use of PK9 water, even with high nitrate levels, does not seem to spur algal growth nearly as much as did the use of reclaimed water.

Figure 1. Lakeside Lake and Surrounding Watershed.

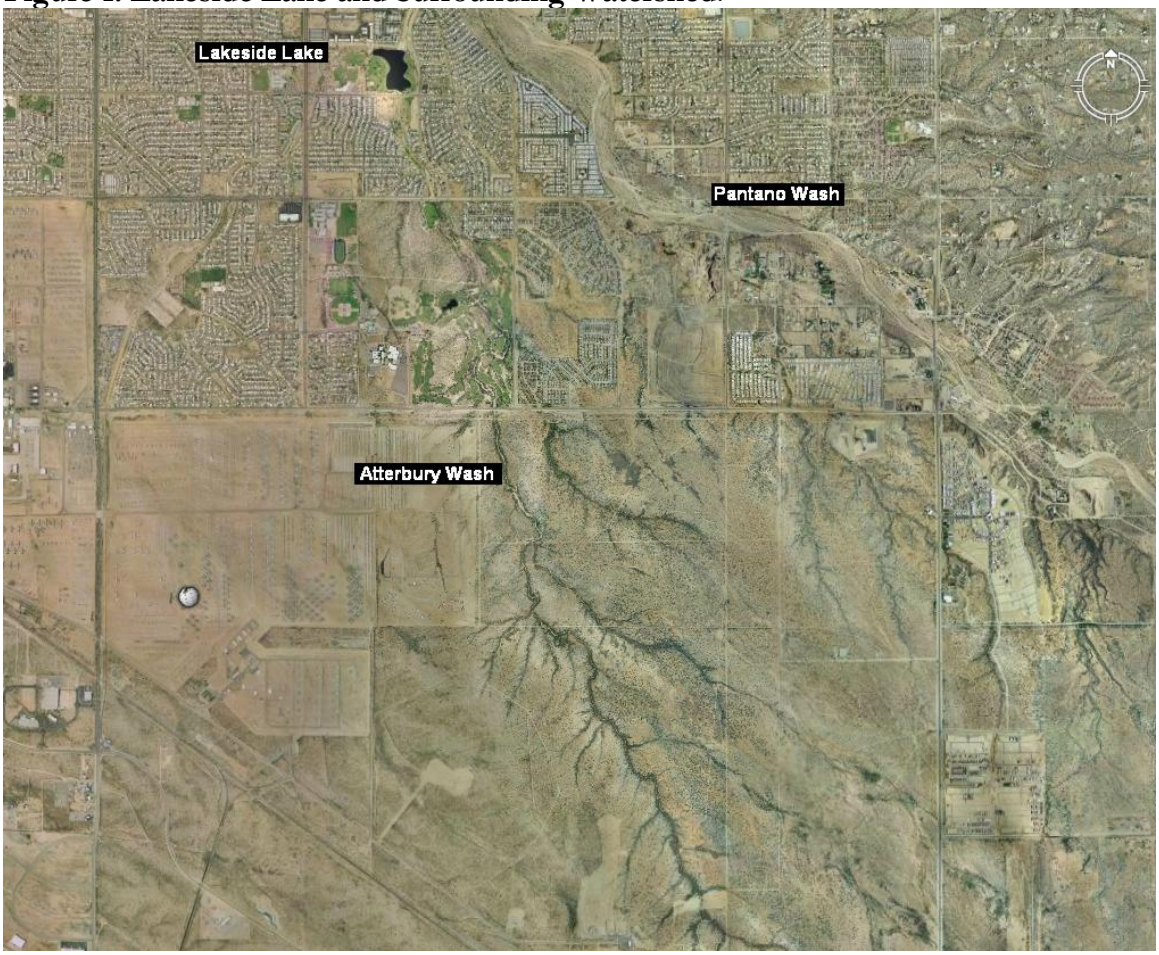


Figure 2. Lakeside showing location of in-lake sampling locations (mixing zone locations are not shown due to uncertainty as of this writing of outfall placement)

Lake Aeration

An aerator was installed in 1992 to try and alleviate problems associated with low dissolved oxygen. This was a diffuser-type of aeration system with an on-shore compressor. This unit was sorely undersized and may likely have resulted in a mean average decrease of dissolved oxygen throughout the water column. Lakeside is, for an urban lake, relatively deep and would likely thermally stratify if not for aeration systems breaking stratification. As with several thermally-stratified lakes, hypolimnetic anoxia would occur during the summer months. Hypolimnetic volume would probably be greater than epilimnetic. The slow infusion of anoxic hypolimnetic water mixing with surface water would result in an overall decrease of dissolved oxygen levels throughout the water column. Since this aeration unit was under-sized, this was likely the case and dissolved oxygen levels were generally very low, especially during the summer months when the water is warmer and oxygen more difficult to solubilize.

A new aeration system was installed in 2001(?). This system was much larger than the previous and designed to maximize hypolimnetic circulation and aeration. This system involved having 2 aerators anchored to the bottom in a structure that released aerated water within the bottom of the lake and 2 aerators closer to the surface to aerate the surface water. The original idea was to maintain a thermally stratified lake but increase dissolved oxygen within a colder, but more oxygenated, hypolimnion while the epilimnion was aerated via the surface diffusers. The system has never been fine-tuned to the point where thermal stratification has been either initiated or maintained.

The goal of an aeration system is not, necessarily, to "add" dissolved oxygen to the water. This goal is usually infeasible, especially when water temperatures are routinely approaching 30^{O} C. during the summer. The goal should be to increase circulation to keep algal biomass in check so that respiration of dead and senescent cells do not increase bacterial respiration thereby decreasing dissolved oxygen levels.

Lake Impairment

Prior to the installation of the new aeration system, and with reclaimed water as the primary source, water quality was often degraded to the point where fish kills would periodically occur during the summer. Algal biomass was extremely large and consisted primarily of noxious, and sometimes toxic, cyanobacteria. Blooms of *Microcystis* sp. would often number in the hundreds of thousands, if not millions, of cells/mL. These blooms would usually concentrate near the surface and become windblown where they resembled green paint along the shore.

With such a large amount of primary production, several water quality variables were affected on a diel basis. During the day, levels of pH would often approach or exceed 10 SU negatively affecting aquatic life. At night, the CO_2 utilized for photosynthesis during the day, would be released back into the water lowering pH.

With such high levels of algal nutrients brought in via the reclaimed water, the only true limitation to algal growth was self-shading. This left a very thin veneer of highly oxygenated water (as a by-product of photosynthesis) at the surface with the remainder of the water

volume acting as a photolytic zone where algal cells would die. This death of algal cells, along with the slow infusion of anoxic hypolimnetic water brought to the surface via the under-sized aeration system, dissolved oxygen levels were minimal to sustain aquatic life and fish were undoubtedly stressed for a majority of the summer. Dissolved oxygen, like pH, would also drop precipitously at night. The large diel fluctuations in dissolved oxygen and pH undoubtedly stressed aquatic life, including fish.

When net respiration exceeds photosynthesis there is a loss of dissolved oxygen from the water. If levels do not drop too low, and organisms have time to adapt, fish kills are unlikely to occur. The critical time for dissolved oxygen levels in Lakeside is during the monsoon season when respiration increases either through clouds decreasing sunlight or through turbid water brought in via Atterbury Wash. The result is often large fish kills usually occurring at night or early the next morning. The chain-of-events leading to fish kills are; large nutrient loading via the reclaimed water resulting in a huge algal biomass which causes dissolved oxygen levels to drop when respiration exceeded photosynthesis.

The new aeration system caused a divisional shift away from cyanobacteria to less noxious and non-toxic chlorophytes. While this should be viewed as substantial improvement, overall algal biomass was and still is, quite large. Generational turn-over rates are longer with chlorophytes than cyanobacteria so dissolved oxygen levels, while achieving more of a steady-state than when cyanobacteria dominated the plankton, still drop to dangerously low levels during critical times of the year (mid-late summer) and fish kills, albeit smaller than previously, have still occurred.

Flows from Atterbury Wash are, on occasion, inevitable. These episodic flows can quickly degrade water quality within the lake and cause depressions in dissolved oxygen even when lake water quality leading up to these events have been deemed adequate for aquatic life. The degree of water quality degradation depends upon the amount of flow and the nature of any episodic event. In this case, maximizing water quality within the lake leading up to these events might cause sufficient buffering for the survival of aquatic life including fish. However, it is anticipated that fish kills of some magnitude will occur at some point in the future due to runoff from Atterbury Wash regardless of water quality in the lake leading up to these events.

New Management and Treatment Opportunities to Improve Water Quality

While the new aeration system was a major step forward in increasing water quality, new management opportunities and in-lake treatment technologies exist to further improve water quality. These techniques are all geared toward decreasing lowering nutrient levels and algal biomass, increasing dissolved oxygen, and lowering pH levels. Since all of these goals are inter-twined, treatment and management should strive to offset any problems at the source, in this case algal nutrients, hopefully with upwardly cascading improvements in water quality and protection of aquatic life.

Whenever possible, the use of reclaimed water should be avoided. This source water has large amounts of algal nutrients and, if used, it would not take long to trigger an algal bloom especially if used during the spring or summer months. Well PK9, even with high nitrate levels, has far fewer bio-available nutrients to spur algal growth. Since it is presently unknown if the flow

rate from PK9 is adequate to maintain lake levels through the summer months due to high rates of evaporation, fore-thought during the winter and spring are required to ensure adequate water levels during the critical summer months.

Much work has been done examining the use of aluminum sulfate to reduce phosphorous loading of both the in-coming PK9 or reclaimed water and also within the lake (see attached document entitled *Lakeside Lake Bench-Scale Testing with Aluminum Sulfate* for bench-scale results and detailed information on aluminum sulfate). This technique show great promise at not only reducing phosphorous loading to the lake, but also of increasing water clarity and removing oxygen-demanding substances from the water column. This would prove especially useful following a turbid flow event via Atterbury Wash.

New management and remediation measures meant to increase water quality within Lakeside will be a combination of stopping or greatly decreasing the use of reclaimed water and adding aluminum sulfate to reduce phosphorous within the lake.

Goals, Objectives, and Action Alert Levels

Action alert levels and noncompliance issues are given in detail in the Draft AZPDES Permit No. AZ0024201 re-printed toward the end of this manual and will not be repeated here. This section is meant to give broad targets of conditions in the day-to-day management of the lake which may merit concern and also to simultaneously work hand-in-hand with the Draft Permit. Methods of reporting any noncompliance issue merits repeating in this section.

Oral reporting of any non-compliance which may endanger the environment or human health shall be made within 24 hours from the time the permittee becomes aware of the event to the ADEQ 24 hour hotline at 602-771-2330. The permittee will also notify the Southern Regional Office at 528-628-6724 by phone call or voice mail by 9 a.m. on the first business day following the noncompliance. The permittee shall also notify the Water Quality Compliance Section in writing within 5 days of the noncompliance event. The permittee shall include in the written notification a description of the noncompliance and its cause; the period of noncompliance, including dates and times, and, if the noncompliance has not been corrected, the time it is expected to continue and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The broad objective of managing Lakeside is to have in-lake conditions such that no harm or undue stress, or threat thereof, occurs to aquatic organisms or humans. As previously mentioned in this report, low dissolved oxygen levels due to bacterial or algal respiration has led to sporadic but frequent fish kills in the past. The broad goal of managing Lakeside should be to prevent the core conditions which may lead to water quality degradation to the extent where harm or stress to aquatic organisms or humans ever occurs. This goal requires much forethought because by the time water quality has degraded to the point where a fish kill becomes imminent, it is usually already too late for any remedial action.

Generally, a core component of lake management should involve reducing algal biomass so that should an acute die-off of algae or other organic material occur, dissolved oxygen depletion does not reach harmful levels. Additionally, should Atterbury Wash introduce a sudden increase in suspended solids, the least amount of algal biomass or organic material in the lake leading up to this flow is *always* the preferred condition as the lake has more

assimilative capacity to accept these flows with a minimal amount of dissolved oxygen depletion.

Any dead fish or organic material should immediately be removed from the water to avoid any further water quality degradation and/or dissolved oxygen depletion.

The best method to achieve the goal of reducing algal nutrients and biomass would be through the use of aluminum sulfate introduced into both outfalls in addition to separate in-lake locations away from the outfalls so that the entire lake volume can be treated as conditions warrant. The use and dosing of aluminum sulfate (alum) should be calculated and delivered to the lake during late winter and early spring to avoid potentially detrimental conditions during more critical times of the year such as mid-late summer and into fall. Additionally, lake level should be kept as high as possible using the PK9 well during late-winter/early spring so that the water level does not drop to a point that prohibits recreation/angling, or degrades water quality through concentration of contaminants, during mid-late summer into fall.

As stated in the report toward the back of this manual entitled "Bench-Scale Testing with Aluminum Sulfate" optimum removal of phosphorous and optimum floc formation occurred between the doses of 1.04 and 2.99 mg/L of elemental aluminum. This dose proved to keep pH in the level where toxicity of dissolved aluminum was minimized so that no acute or chronic toxicity occurred to aquatic organisms. *Every effort to maintain this concentration of aluminum in the water column, while keeping pH levels below 8.0, beginning in early spring throughout fall should be striven for.*

The following is a non-exhaustive list of water quality variables where levels above a certain range should warrant concern and/or remediative action.

Dissolved Oxygen (mg/L): no less than 6.0 in the first half of the water column and no less than 2.0 in the bottom half of the water column.

pH (SU): no less than 6.5 and not greater than 9.0. (the lower and upper limits for compliance)

Chlorophyll a (mg/m3): No more than 50 but concern should be given to levels approaching ~40. Levels greater than 50 are considered out of compliance.

Total Residual Chlorine (mg/L): Concern should be given to levels approaching 0.006. Levels exceeding 0.008 on a daily average are considered out of compliance.

Total Phosphorous (mg/L): Levels approaching or above 0.01.

Orthophosphorous (mg/L): Levels above 0.009 are out of compliance.

Ammonia: Temperature and pH dependent but any level of ammonia, especially un-ionized, is cause for concern.

Specific Conductance (µS/cm): Any level exceeding 2500 is cause for concern.

Oxidation-Reduction Potential (mV): Any level less than 20 (negative numbers are especially cause for concern).

Cyanobacteria: If the total number of cyanobacteria species constitute 40% or more of the total algal biomass, this is cause for concern.

Occasionally, there are benthic mats of attached algae (comprised mostly of *Spirogyra sp.*) growing on the shelf extending from the shore. This algae, while primarily a nuisance to angling and aesthestically un-pleasing, can and should be controlled using any number of granulated algaecides applied by personnel certified and trained to do so. This species forms resting autospores which will remain dormant in the sediment until environmental conditions are once again conducive for their growth. This means granular algaecide should be applied as a spot treatment beginning during late winter and early spring and then as needed to control growth.

Sampling and Analysis Plan

Field Equipment and Physico-chemical Sampling

All physico-chemical variables will be collected using a multi-probe data logger and sonde (HydroLab Surveyor 4 or equivalent) from the surface of the water every meter to half meter (depending upon field conditions) to a point 0.5 meters above lake sediments. Calibration of all field equipment will occur on-site just prior to and immediately following sampling. Water samples to be submitted for laboratory analyses will be collected in pre-cleaned, sterilized, and pre-preserved (when appropriate) bottles provided by a state-certified laboratory. Turbidity meters will also be calibrated on-site using solid secondary standards pre-calibrated against liquid standards in the lab. If the difference is greater than 5% using the solid secondary standard, calibration with liquid standards will be performed in the field and noted on the field data sheet. Calibration field sheets for all calibrate-able field equipment will be filled out in the field and submitted with any monthly or annual reports to ADEQ.

Aqueous samples will be collected using a pre-cleaned and sterilized 4-liter beta or Van-Dorn style sampling bottle. Where this volume is not enough to collect the entire samples to be collected at a site, samples will be composited in a Teflon churn splitter and mixed slowly prior to placement in sample bottles.

Sampling will occur no earlier than 10 am or any later than 4 pm

Reporting to ADEQ will occur monthly with an annual report due every February.

Secchi disk depth will be collected at all sites.

All data will be input into spreadsheet-style, statistical software program (JMP-IN) within 14 days of receiving lab results and within 7 days of all field measurements. This database will be made available to ADEQ at their request in a comma-delimited format.

Physico-chemical data at all sites will include:

Temperature
pH
ORP
Dissolved Oxygen (% saturation and mg/L)
Conductivity
Secchi disk depth
Turbidity

Weekly Outfall Sampling

Outfall 001
pH
Flow data (both monthly average and daily max)

Outfall 002

All are discrete samples except for ortho- and total P which are 8 hour flow-weighted composites.

Ammonia
Dissolved Oxygen (% sat. and mg/L)
E. coli
Ortho-P
Total P
Total residual chlorine
Temperature
pH

Twice per Summer Outfall Sampling
Outfall 001

All are discrete and metals are all totals

Berylium
Cadmium
Chromium VI
Copper
Cyanide
Lead
Mercury
Oil and Grease
Selenium
Silver
Sulfides
Thallium
Hardness

Outfall 002
All are 8 hour flow-weighted composites. Metals are all totals

Cadmium
Chromium
Lead
Mercury

Outfalls 001 and 002 - Annually
All are 8 hr, flow-weighted composites except for chromium VI and cyanide which are discrete. All metals are totals only except for aluminum which is total and dissolved.

WET Testing
Chronic and acute for *Selenastrum capricornutum, Pimephales promelas*, and *Ceriodaphnia dubia*

Metals
Aluminum
Antimony
Arsenic
Beryllium
Cadmium
Chromium
Chromium VI
Copper
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc
Cyanide

VOC's *(must be taken as 4 discrete samples over an 8 hr time frame)*
Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-chloroethylvinyl ether
Chloroform
Dichlorobromomethane
1,1-dichloroethane
1,2-dichloroethane
Trans-1,2-dichloroethylene

1,1-dichloroethylene
1,2-dichloropropane
1,3-dichloropropylene
Ethylbenzene
Methyl bromide
Methyl chloride
Methylene chloride
1,1,2,2-tetrachloroethane
Tetrachloroethylene
Toluene
1,1,1-trichloroethane
Trichloroethylene
Vinyl chloride

Acid-extractable Compounds
P-chloro-m-cresol
2-chlorophenol
2,4-dichlorophenol
4,6-dinitro-cresol
2,4-dinitrophenol
2-dinitrophenol
2-nitrophenol
4-nitrophenol
Pentachlorophenol
Phenol
2,4,6-trichlorophenol

Base-neutral Compounds
Acenaphthene
Acenaphthylene
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
3,4 benzofluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Bis (2-chloroethoxy) methane
Bis (2-chloroethyl) ether
Bis (2-chloroisopropyl) ether
Bis (2-ethylhexyl) phthalate
4-bromophenyl phenyl ether
Butyl benzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenyl ether
Chrysene
Di-n-butyl phthalate
Di-n-octyl phthalate

Dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3-dichlorobenzidine
Diethyl phthalate
Dimethyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
Fluoranthrene
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N-nitrosodi-n-propylamine
N-nitrosodimethylamine
N-nitrosodipheylamine
Phenanthrene
Pyrene
1,2,4-trichlorobenzene

Additional Parameters from Arizona Surface Water Quality Standards
Aldrin
Barium
Boron
Chlordane
1,2-cis-Dichloroethylene
DBCP
EDB
4,4-DDD (p,p-Dichlorodiphenyldichloroethane)
4,4-DDE (p,p-Dichlorodiphenyldichloroethylene)
4,4-DDT (p,p-Dichlorodiphenyltrichloroethane)
Dieldrin
Di (2-ethylhexyl) adipate
Endosulfan sulfate
Endosulfan (total)
Endrin
Endrin aldehyde
Fluoride
Heptachlor
Heptachlor epoxide

Hexachlorocyclohexane alpha Alpha-BHC
Hexachlorocyclohexane beta
Hexachlorocyclohexane delta
Hexachlorocyclohexane gamme (lindane)
Manganese
PCB's
Styrene
Sulfides
2,3,7,8-Tetrachlorodibenzo-p-dioxin
Toxaphene
Xylene

Mixing Zone Sampling

A mixing zone requirement has been implemented for Lakeside. Sampling requirements and parameters vary depending upon which water source is being used; PK9 (outfall 001) or reclaimed water (outfall 002). At least 2 sites will be chosen within a 125 foot radius of the outfalls (acute) and 3 sites will be chosen within a 250 foot radius of the outfalls (chronic). Samples will be collected from 0.5 meters below the surface and 0.5 meters above lake sediments. Physico-chemical profiles through the water column will be taken as described under "Field Equipment and Physico-chemical Sampling"

Sampling will occur weekly from July – October; biweekly from November - December and April - June; monthly from January – March.

Ammonia
Total Kjeldahl Nitrogen
Chlorine
Chlorophyll-a (composite of 3 surface locations at chronic zones only)
Nitrate/nitrite
Ortho-P
Total P
Aluminum (total and dissolved)

In-Lake Sampling (Sites SCLAK-A and SCLAK-B)

Samples will be collected from 0.5 meters below the surface and 0.5 meters above lake sediments. Physico-chemical profiles through the water column will be taken as described under "Field Equipment and Physico-chemical Sampling".
Due to the intense sampling regimen for compliance monitoring scheduled for Lakeside, any additional ambient monitoring is likely not required. Should the compliance monitoring schedule change or reduce in scope or timing, an ambient monitoring program will be established at that time.

Sampling will occur weekly from July – October; biweekly from November - December and April - June; monthly from January – March.

Ammonia
Total Kjeldahl Nitrogen
Chlorine
Chlorophyll-a (surface samples only)
Algal Identification and Enumeration (surface samples only)
Nitrate/nitrite
Total Organic Carbon
Dissolved Organic Carbon
Ortho-P
Total P
Aluminum (total and dissolved)
Zooplankton (one horizontal tow between SCLAK-A and SCLAK-B)

Bench-Scale Testing with Aluminum Sulfate

Methods

Samples were obtained from Lakeside Lake, reclaimed water (prior to entering the lake), and well PK-09 (prior to entering the lake), for testing with aluminum sulfate (alum) to determine the potential use of alum in alleviating problems associated with eutrophication.

Lake samples were collected on 09/04/06 from the surface of site SCLAK-B (North Site). Turbidity due to recent storm events and subsequent runoff via Atterbury Wash into the lake was pronounced. Algal biomass was low likely due to light limitation in addition to dilution and flushing of lake water. Algal biomass, however, had been relatively low leading up to these runoff events.

Samples were collected from well PK-09 and the reclaimed water line prior to entering the lake on 09/12/06. Both samples were collected in acid-washed and sterilized, 10 liter plastic carboys. Reclaimed water was allowed to run for approximately 45 minutes prior to collection. Water from well PK-09 initially came out orangish-brown indicating rust contamination this water was allowed to run for approximately 2 hours after which time any visible discoloration was gone and water was collected.

At the lab, water was placed into a 4-liter churn splitter and homogenized prior to transferring into 5, acid-cleaned, 1-liter beakers. Liquid alum was purchased from Orca Water Technologies LLC. The solution supplied was 46 ± 3% alum by weight, 7.9 ± 0.5% Al_2O_3, 4.2 ± 0.3% Al, and 0.3 ± 0.2% sulfuric acid with a specific gravity of 1.32 ± 0.01.

The alum mixture was diluted with nanopure water and the following alum doses were added to each beaker with a digital pipette to derive our aluminum (not alum) concentrations per liter of sample water.

0.1 mL alum = 0.13 ppm Al
0.4 mL alum = 0.52 ppm Al
0.8 mL alum = 1.04 ppm Al
2.3 mL alum = 2.99 ppm Al
3.9 mL alum = 5.08 ppm Al

Samples were stirred using a 6-paddle, Phipps & Bird floc jar apparatus at approximately 100 rpm for 5 minutes, 50 rpm for 6 hours, and then were allowed to settle for 18-20 hours. All samples except for total aluminum were collected off the supernatant being careful not to disturb the floc. After these samples were obtained, the paddles were turned back on at 100 rpm to once again homogenize the sample for collection of the total aluminum sample.

Background

Free Al^{+3} ions are formed when aluminum sulfate, $Al_2(SO_4)_3$ is added to water and these ions are quickly attached to six water molecules to form $Al(H_2O)_6^{+3}$. Several hydrolytic species are next formed due to a successive loss of protons to surrounding water molecules (Harper 1990).

$$Al(H_2O)_6^{+3} + H_2O \rightleftharpoons Al(H_2O)_5OH^{+2} + H_3O^+$$

$$Al(H_2O)_5OH^{+2} + H_2O \rightleftharpoons Al(OH)_2(H_2O_4)^+ + H_3O^+$$

$$Al(OH)_2(H_2O_4)^+ + H_2O \rightleftharpoons Al(OH)_3(H_2O)_{3(s)} + H_3O^+$$

The final product, $Al(OH)_3(H_2O)_3$, is the alum precipitate or "floc" and is usually written as $Al(OH)_3$.

Under alkaline conditions an additional reaction can occur:

$$Al(H_2O)_6^{+3} + 4H_2O \rightleftharpoons Al(OH)_4^- + 4\ H_3O^+$$

There are three mechanisms of phosphorous removal by alum in water (Cooke & Kennedy, 1981, Harper 1990);

- from the formation of insoluble $AlPO_4$,
- by sorption on the surface of the $Al(OH)_3$ floc and,
- by entrapment of phosphorous-containing particulate matter in the $Al(OH)_3$ floc.

This same mode of action by alum to remove phosphorous can also significantly increase the settling rate of suspended particulate material from the water column and has even been shown to remove dissolved organic material adding to color of the water. Since this suspended material carries an oxygen demand with it, the effect of removing an essential nutrient for algal growth (P) combined with removing suspended material would likely result in increased dissolved oxygen levels within the water column.

Toxicity

Like many metals, the toxicity of aluminum is not well correlated with levels of total aluminum but is correlated with the biologically-active fraction. The inorganic, monomeric form of aluminum, Al^{+3}, is believed to be the most toxic. Toxicity of aluminum in a waterbody is usually measured as the dissolved fraction of the total and is dependent upon other water quality criteria, especially pH levels. Under typical situations encountered in freshwater environments, the toxic fraction is an extremely small fraction of the total (Livingston et al., 1994). Increasing toxicity is reported in the literature at pH levels below 5.5 and above 8.5.

Numerous studies have been performed to determine the toxicity of aluminum to fishes and have concluded that:
-Surges of labile aluminum during snowmelt and heavy rainfall were potentially lethal to fish eggs and fry (Driscoll et al., 1980)
-At low pH, doses as small as 50 μg/L of aluminum have decreased growth and survival of cutthroat trout (Woodward et al., 1989) small-mouth bass (Kane and Rabeni, 1987), and post-larval white suckers (Baker and Schofield, 1982).
-Toxicity of aluminum varies with pH and life history stage of fish.
-The extent of aluminum toxicity appears to be dependent on pH levels, total concentration, and the speciation of dissolved aluminum.
- The mechanism of toxicity to fish is likely due to the inability of fish to maintain their osmo-regulatory balance as well as respiratory problems associated with coagulation of mucous on gills.
Toxicity of aluminum on invertebrate species has been conducted following in-lake alum treatments of lakes and has concluded that:
- Acute concentrations of aluminum hydroxide has no acute effect on the chironomid *Tantytarsus dissimulus* but chronic assays were noted at all alum doses (Lamb and Bailey, 1981).
- No indications of short- or long-term toxicity to benthic invertebrates were observed in Horseshoe Lake following an alum treatment (Narf, 1978).

The Environmental Protection Agency based upon a review of the above information, established guidelines for aluminum concentrations for over 20 species of freshwater organisms ranging from algae to aquatic invertebrates to fish. To avoid chronic toxicity to organisms, the EPA has established conservative criteria that the four-day average concentration of dissolved aluminum not exceed 87 μg/L more than once every three years when the ambient pH is between 6.5 and 9.0. Regarding acute toxicity, the criteria states that the one-hour average concentration of dissolved aluminum not exceed 750 μg/L more than once every three years when pH levels are between 6.5 and 9.0.

Results

The best results in the lake samples were obtained between the doses of 1.04 and 2.99 ppm of Al, however, improvement over raw lake water was observed at all doses. Total suspended solids was significantly decreased even at the dose of 0.13 ppm Al. and improved in a dose-dependent manner after this. The samples used for this testing from the lake had high turbidity and low algal biomass so the 24 hour pH levels would likely have been higher

in samples obtained during a more typical year. Alum did not significantly reduce any of the nitrogenous compounds but did significantly increase sulfate and decrease total alkalinity again in a dose-dependent manner. Total alkalinity levels within Lakeside, in lieu of any significant runoff from Atterbury Wash, are typically much higher so that the relatively low levels observed at the higher alum doses during this testing, and would typically be much higher. Sulfate levels are always an issue due to the production of hydrogen sulfide and its related toxicity to aquatic organisms, however, if dissolved oxygen levels can be increased and algal biomass decreased through the use of alum, then hydrogen sulfide should not be formed within the lake to any appreciable extent.

The reclaimed water had relatively high levels of both ortho- and total phosphorous in the raw samples so that it required higher doses of alum to bring these levels down. Alum still significantly reduced levels of both ortho- and total phosphorous and, if diluted with water from well PK-09 which had extremely low levels of phosphorus, would likely result in a large decrease in P loading to Lakeside. It seems feasible, based upon these results, that Lakeside could be made to be P-limited resulting in a significant decrease in algal biomass and increase in dissolved oxygen levels.

Another benefit of alum observed in these results is the very significant reduction of suspended solids and turbidity observed in the lake samples. These suspended solids have an associated oxygen demand and removing them from the water column as quickly as possible can only result in increased dissolved oxygen levels.

Taking the extremely conservative approach of the already-conservative EPA guidelines for dissolved aluminum toxicity of 87 µg/L (0.087 mg/L), this report would recommend dissolved aluminum levels be kept below 75µg/L (0.075 mg/L) at all times. Two doses from within the lake samples, LKS-0.52 and LKS-0.13, exceeded this self-imposed, chronically toxic level when the dissolved aluminum fractions were 180 µg/L at a pH of 7.45 and 100 µg/L at a pH of 7.45 respectively. No levels came close to being acutely toxic.

If alum is to be used in Lakeside, careful and frequent monitoring of in-lake conditions by trained personnel would be essential to ensure no chronic or acute toxicity occurs to aquatic organisms.

Cost

The lowest results that did not cross the upper toxicity level of 0.075 mg/L but still significantly reduced phosphorous and suspended sediment levels within the lake samples was LKS-2.99. This dose was measured at 3.05 mg/L of total aluminum but will be rounded to 3.0 mg/L for this calculation. It is important to remember that dosing of the lake will have to be adjusted throughout the year depending upon phosphorous loading, evaporation, runoff into the lake, amount of seepage, total alkalinity, pH levels, and many different variables which cannot all be taken into consideration in this report. Cost can be calculated either up or down depending upon concentrations that need to be achieved within the lake; however, the 3.0 mg/L range seems like a logical "starting point" given the results of this bench-scale testing. This cost is associated with the amount of liquid alum it would take to get aluminum throughout the entire water column to 3.0 mg/L. Once this level is achieved, maintenance levels would cost far less than this initial estimate. Again, the exact price it

would take to maintain a level of 3.0 mg/L depends upon a multitude of variables that are outside the scope of this report. The cost of liquid alum varies regionally but nation-wide seems to (conservatively) be between 10 and 20 cents per pound of alum.

Lakeside is approximately 150 acre feet when full which equals 154,190,000 liters. Liquid alum usually contains 4.3% aluminum. The 3 mg/L dose of aluminum is equivalent to 0.06977 g/L of alum.

0.06977 grams X 154,190,000 L = 10,757,836.3 grams.

10,757,836.3 grams = 23,714 pounds of liquid alum.

23,714 pounds of liquid alum at 10 cents/pound = **$2371**

23,714 pounds of liquid alum at 20 cents per pound = **$4743**

The median cost of adding liquid alum to Lakeside Lake to achieve an aluminum concentration of 3.0 mg/L throughout the water column is **$3557.**

Lake Samples Collected from the Surface of Site SCLAK-B on 09/04/06

Sample ID	Total Al (mg/L)	Diss. Al (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	TSS (mg/L)	pH-1 min.	pH-1 hr
Raw Lake Water	<0.01	<0.01	0.32	0.38	52.3	7.78	
LKS-0.13	0.15	0.1	0.2	0.32	14.3	7.16	7.04
LKS-0.52	0.52	0.18	0.12	0.28	9.7	6.8	6.75
LKS-1.04	1.07	0.07	0.08	0.16	6.0	6.58	6.63
LKS-2.99	3.05	0.04	<0.05	0.07	1.1	6.43	6.13
LKS-5.08	5.13	0.03	<0.05	<0.05	<1.0	5.94	6.15

Sample ID	pH-24 hr	Total Alk. (mg/L)	NO3-N (mg/L)	NH4-N (mg/L)	Total N (mg/L).	Sulfate (mg/L)
Raw Lake Water		74.2	0.43	0.22	0.73	2.3
LKS-0.13	7.45	69.1	0.39	0.2	0.61	3.56
LKS-0.52	7.45	66.5	0.36	0.2	0.6	8.13
LKS-1.04	7.08	64.0	0.36	0.19	0.62	13.7
LKS-2.99	6.77	36.3	0.35	0.17	0.58	36.6
LKS-5.08	6.38	12.9	0.35	0.15	0.55	58.55

Sample ID	TOC (mg/L)	DOC (mg/L)	Turbidity-24 hr. (NTU's)
Raw Lake Water	7.41	2.85	67.1
LKS-0.13	5.3	2.8	25.0
LKS-0.52	4.99	2.43	26.7
LKS-1.04	4.99	2.11	11.02
LKS-2.99	3.73	2.11	1.83
LKS-5.08	3.61	1.64	1.23

Reclaimed Water
Collected on 09/12/06

Sample ID	Total Al (mg/L)	Diss. Al (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	TSS (mg/L)	pH-1 min.	pH-1 hr
Raw Reclaimed Water	0.16	0.01	2.05	2.07	6.0	7.57	
RE-0.13	0.33	<0.01	1.77	1.75	4.1	7.54	7.54
RE-0.52	0.65	0.07	1.39	1.59	3.0	7.43	7.44
RE-1.04	1.22	0.02	1.24	1.28	2.5	7.34	7.01
RE-2.99	3.24	0.02	0.44	0.48	1.2	7.05	6.97
RE-5.08	5.30	<0.01	0.13	0.23	<1.0	6.77	6.85

Sample ID	pH-24 hr	Total Alk. (mg/L)	NO3-N (mg/L)	NH4-N (mg/L)	Total N (mg/L).	Sulfate (mg/L)
Raw Reclaimed Water		170.0	2.72	<0.05	4.08	99.04
RE-0.13	7.56	170.0	2.81	<0.05	4.00	109.24
RE-0.52	7.55	163.4	3.04	<0.05	3.88	113.98
RE-1.04	7.26	157.8	3.12	<0.05	3.57	121.7
RE-2.99	7.16	133.5	3.12	<0.05	3.63	147.21
RE-5.08	7.02	116.2	2.75	<0.05	3.09	176.00

Sample ID	TOC (mg/L)	DOC (mg/L)	Turbidity-24 hr. (NTU's)
Raw Reclaimed Water	1.38	1.13	2.66
RE-0.13	1.36	1.38	0.79
RE-0.52	1.34	1.11	0.35
RE-1.04	1.27	1.16	0.30
RE-2.99	1.21	1.17	0.26
RE-5.08	1.19	1.08	0.17

Well PK-09
Collected on 09/12/06

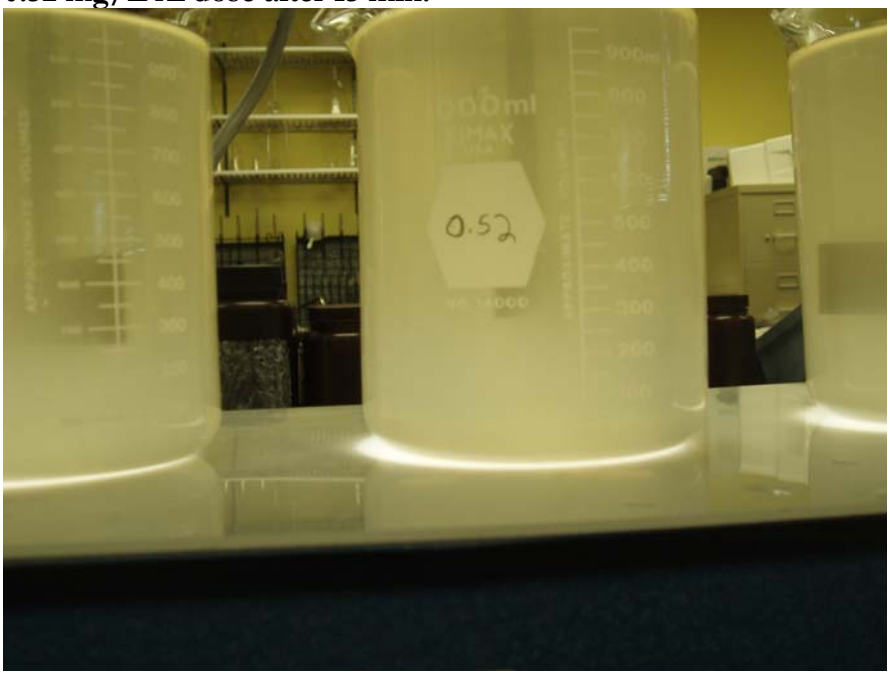
Sample ID	Total Al (mg/L)	Diss. Al (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	TSS (mg/L)	pH-1 min.	pH-1 hr
Initial (raw Pk-09 water)	<0.01	<0.01	0.03	<0.01	5.3	7.77	
0.13	0.15	<0.01	<0.01	<0.01	3.9	6.81	7.14
0.52	0.48	0.07	<0.01	<0.01	4.0	6.77	7.02
1.04	0.97	0.03	<0.01	<0.01	0.3	6.65	6.89
2.99	2.76	0.03	<0.01	<0.01	<1.0	6.42	6.61
5.08	4.88	0.02	<0.01	<0.01	<1.0	6.21	6.57

Sample ID	pH-24 hr	Total Alk. (mg/L)	NO3-N (mg/L)	NH4-N (mg/L)	Total N (mg/L).	Sulfate (mg/L)
Initial (raw Pk-09 water)		183.7	14.03	0.12	14.51	26.08
0.13	7.47	160.4	13.12	0.05	13.48	32.05
0.52	7.26	158.8	12.84	<0.05	13.16	35.03
1.04	7.18	153.3	12.90	<0.05	13.22	42.14
2.99	6.82	144.6	13.35	<0.05	13.68	69.38
5.08	6.75	122.8	13.34	<0.05	13.81	98.92

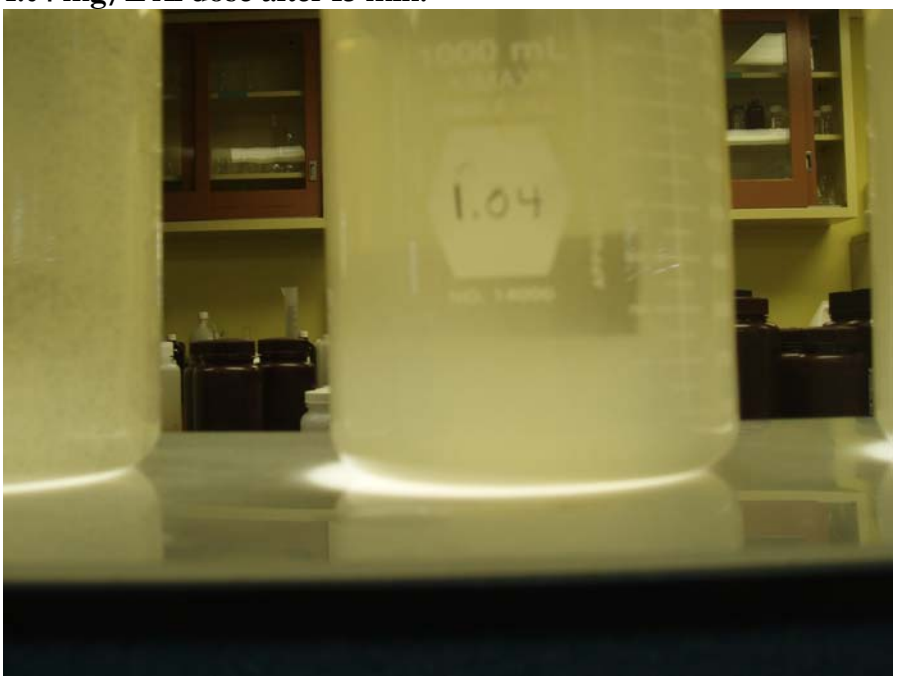
Sample ID	TOC (mg/L)	DOC (mg/L)	Turbidity-24 hr. (NTU's)
Initial (raw Pk-09 water)	<0.1	<0.1	0.86
0.13	<0.1	<0.1	0.51
0.52	<0.1	<0.1	0.48
1.04	<0.1	<0.1	0.47
2.99	<0.1	<0.1	0.41
5.08	<0.1	<0.1	0.20

0.13mg/L Al dose after 15 min.

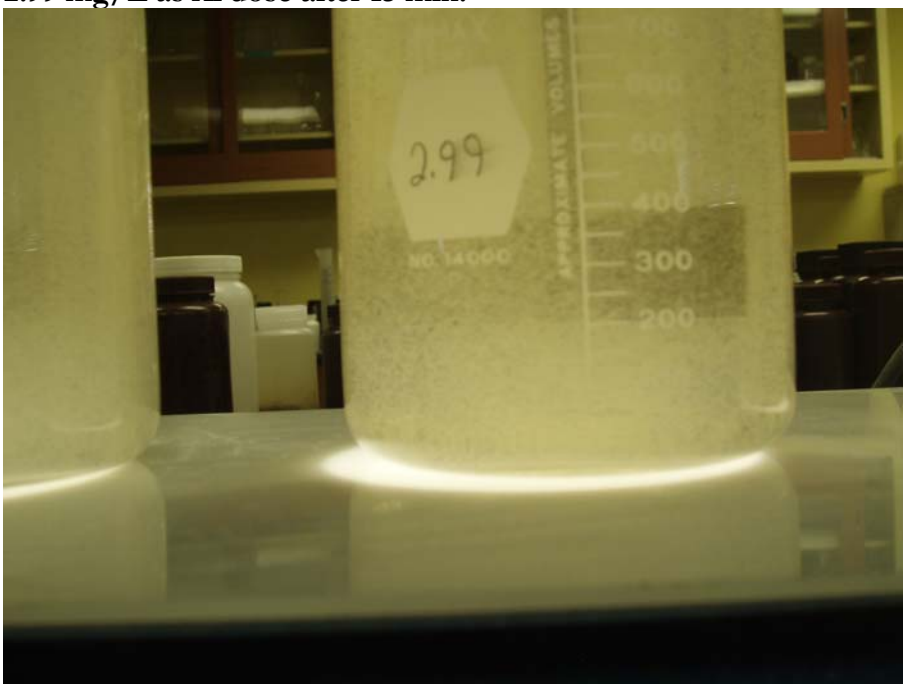
0.52 mg/L Al dose after 15 min.



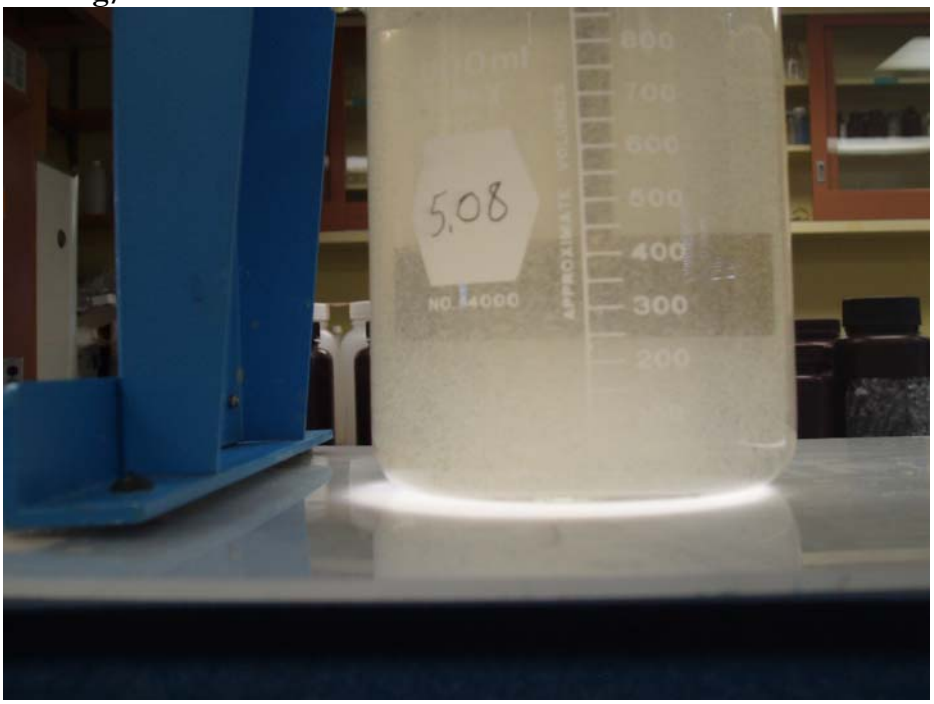
1.04 mg/L Al dose after 15 min.



2.99 mg/L as Al dose after 15 min.

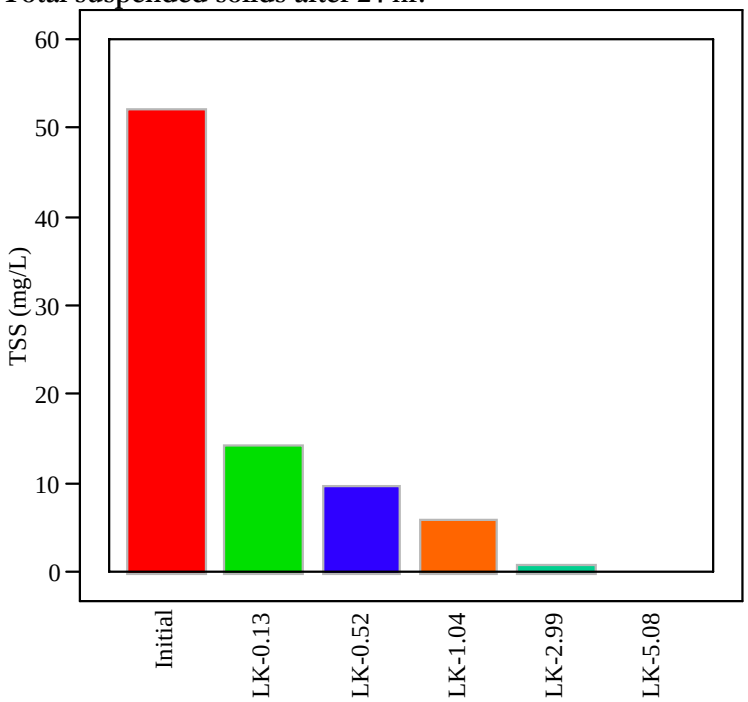


5.08 mg/L as Al dose after 15 min.

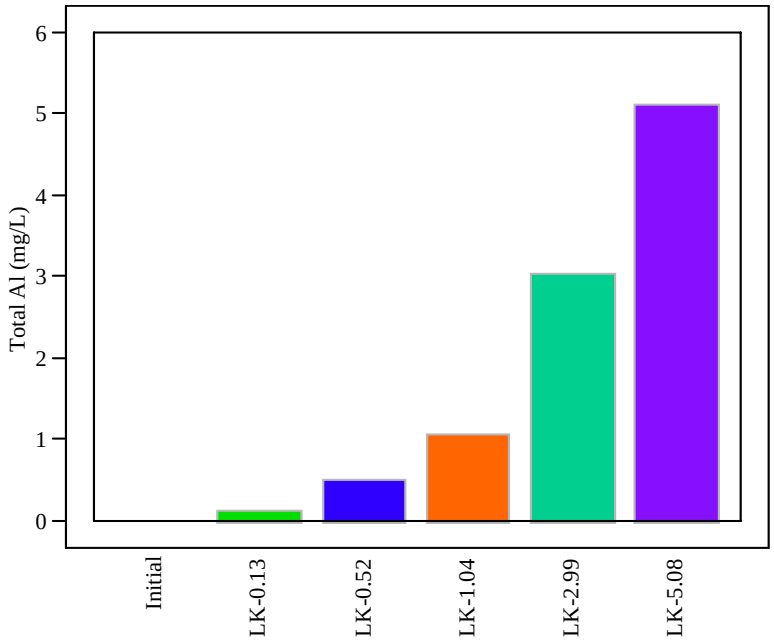


24 hour results after settling

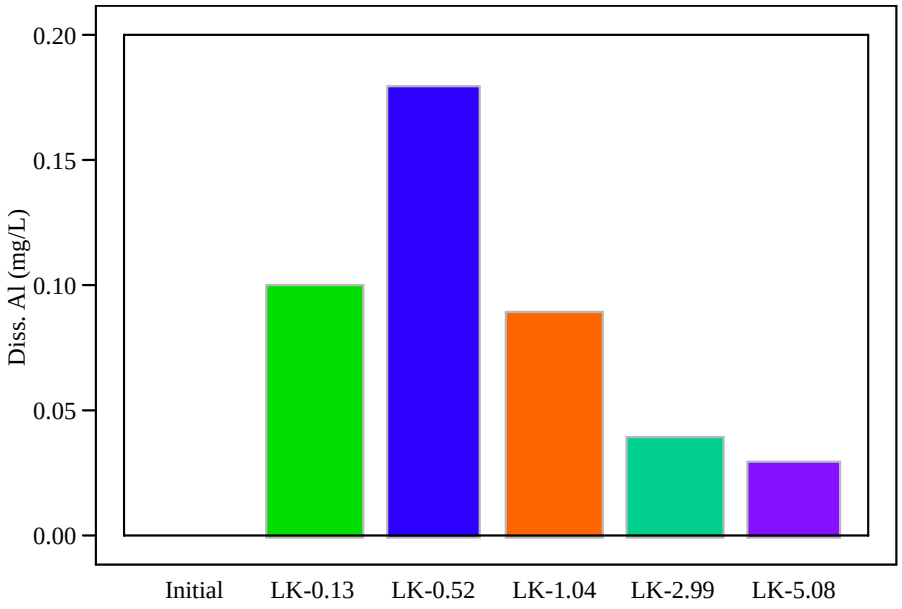
Total suspended solids after 24 hr.



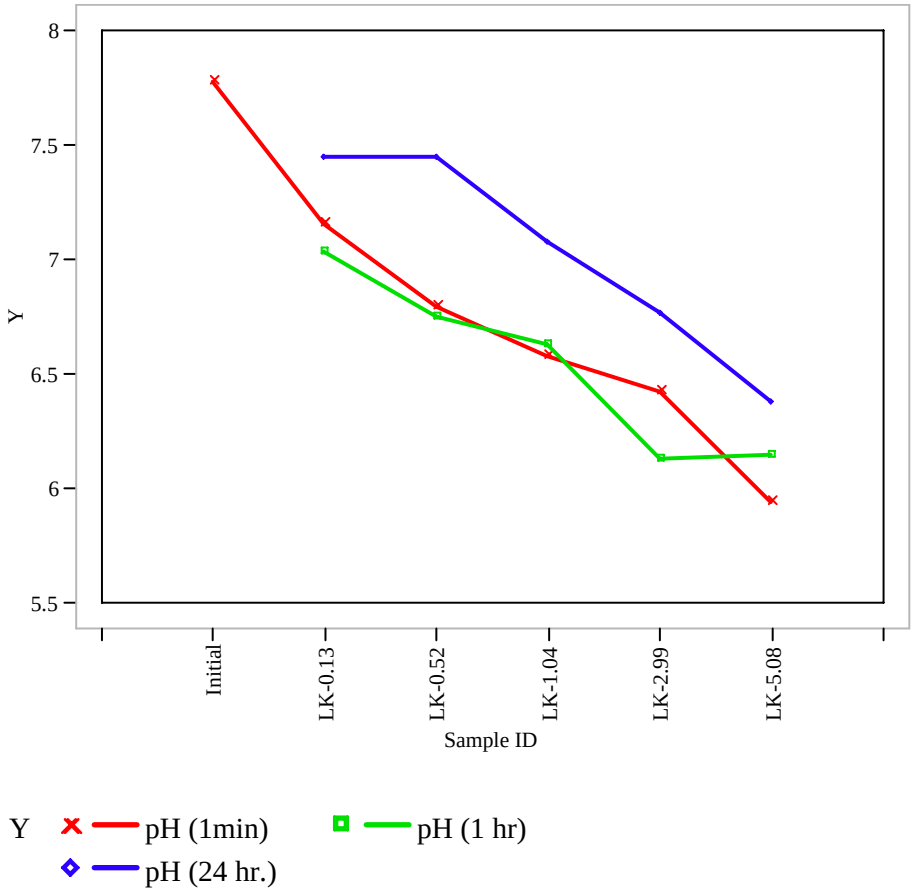
Total Al levels after 24 hr.



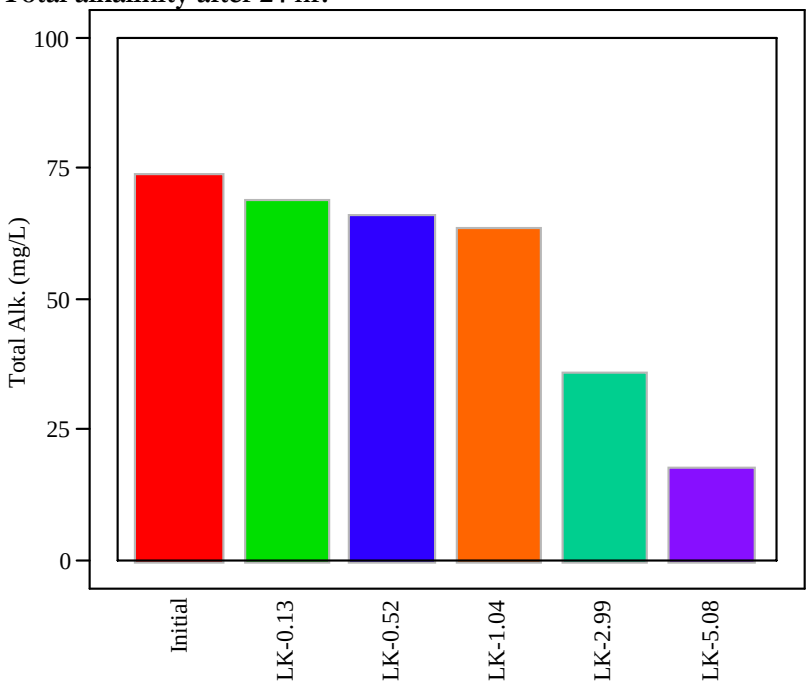
Dissolved Al levels after 24 hr.



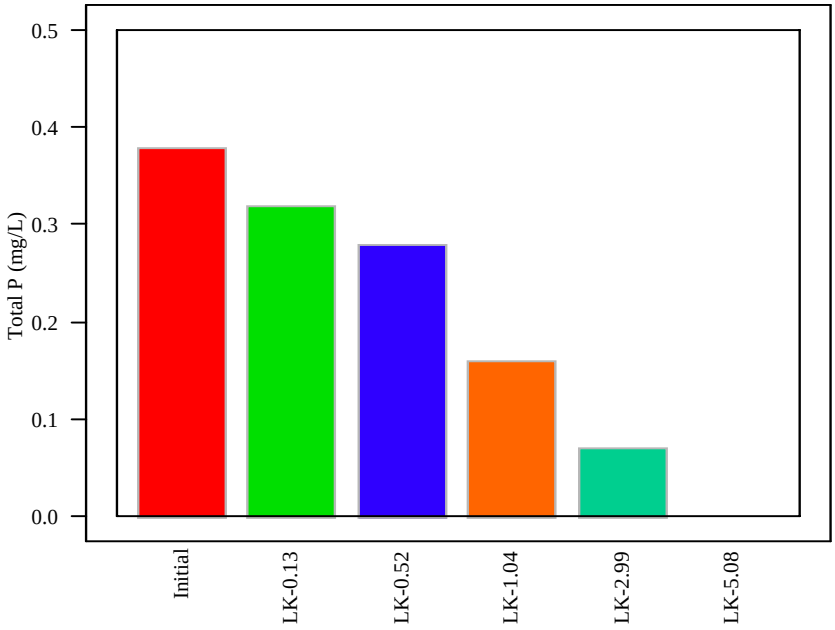
pH levels by dose and time



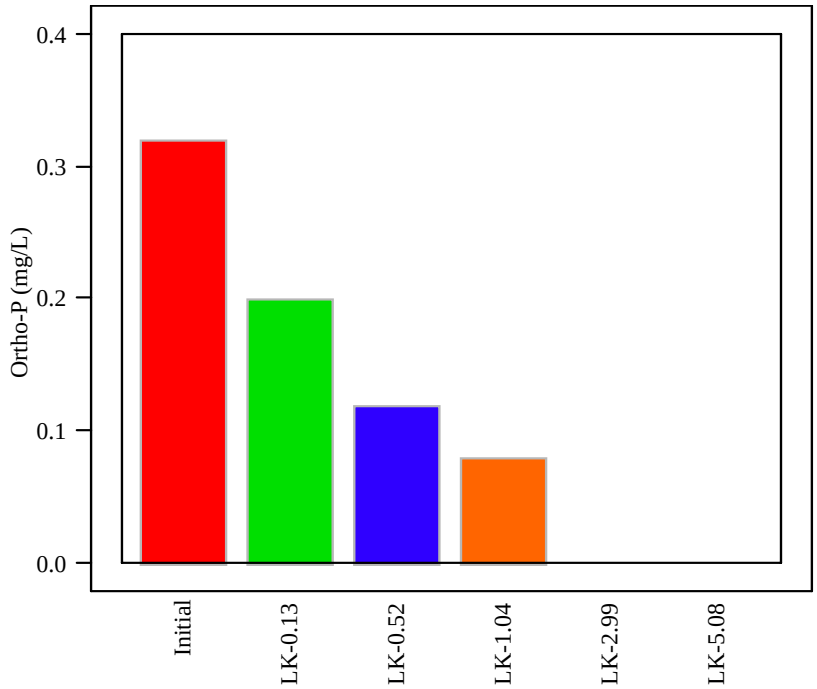
Total alkalinity after 24 hr.



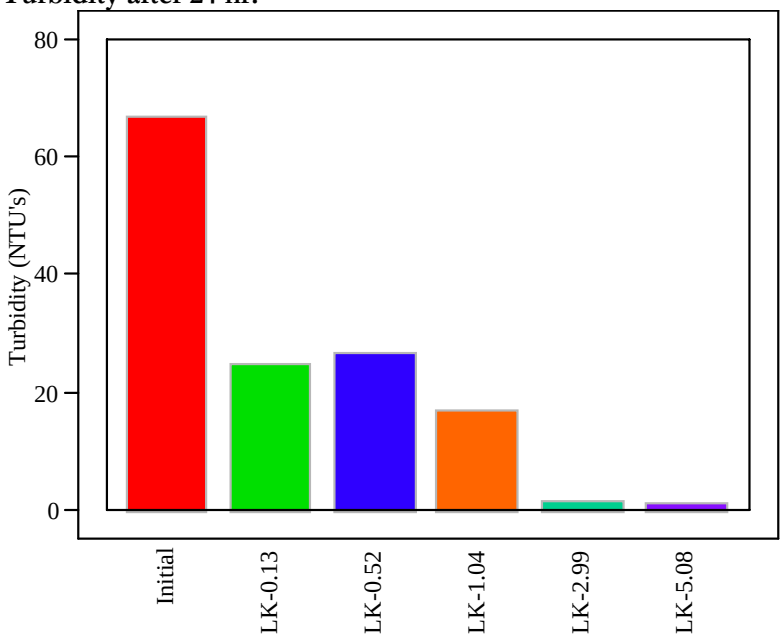
Total P after 24 hr.



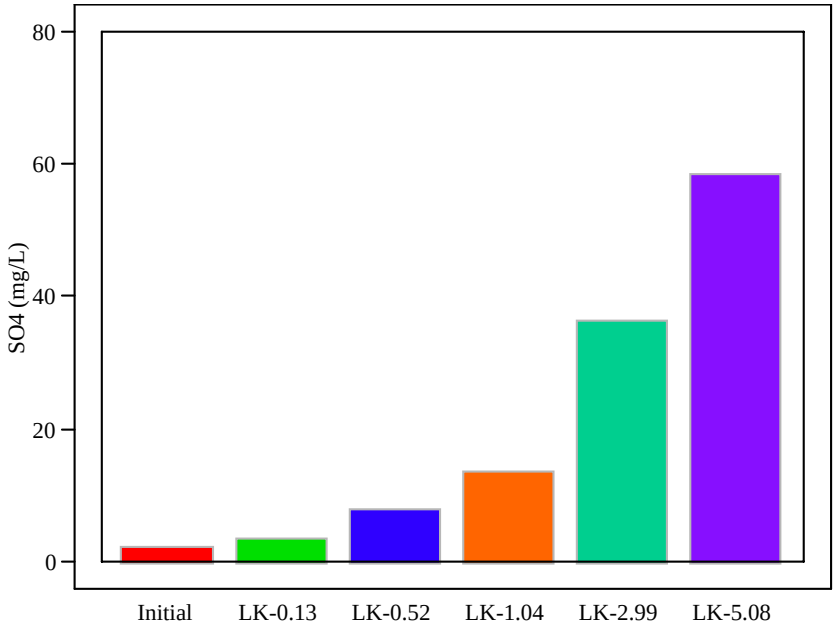
Ortho-P after 24 hr.



Turbidity after 24 hr.



Sulfate levels after 24 hr.



Acknowledgements

Thanks to Jeff Herr and Paul Jensen of PBS&J for providing invaluable information toward the completion of this report.

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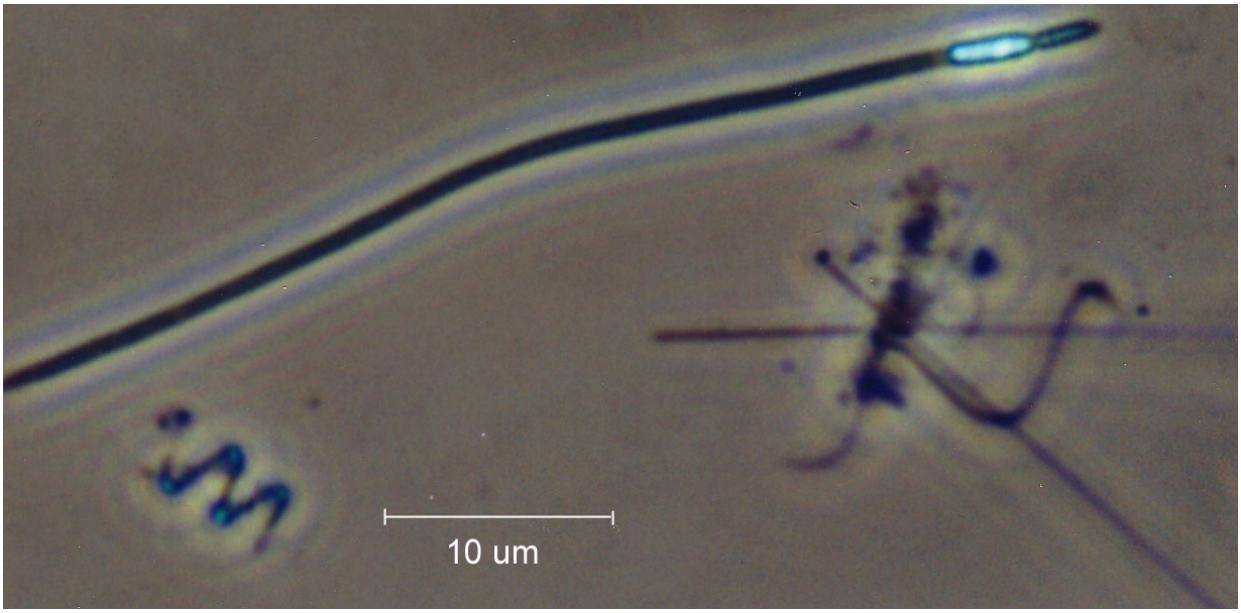
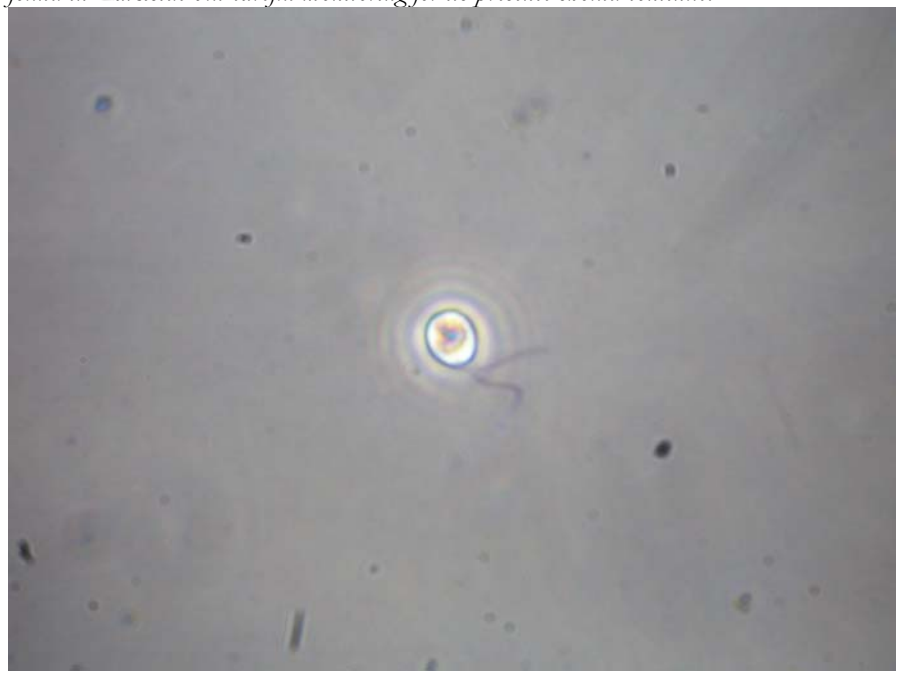
Algae Images

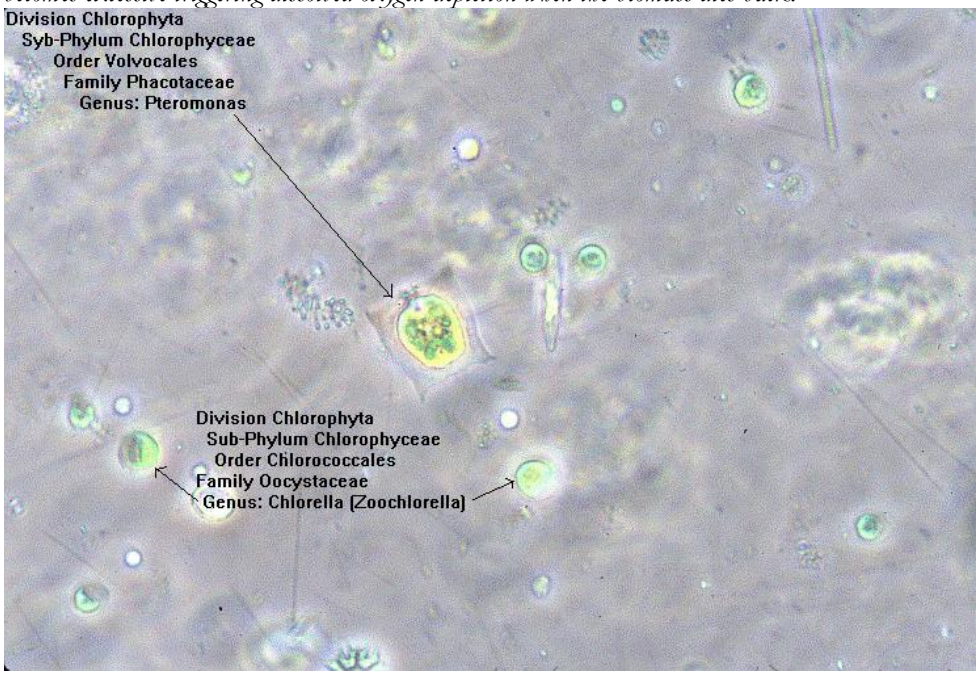
Cylindrospermopsis raciborskii has been found on occasion in Lakeside. C. raciborskii found by the author at other locations in Arizona have shown to produce copious amounts of a potent hepatotoxin under certain environmental conditions



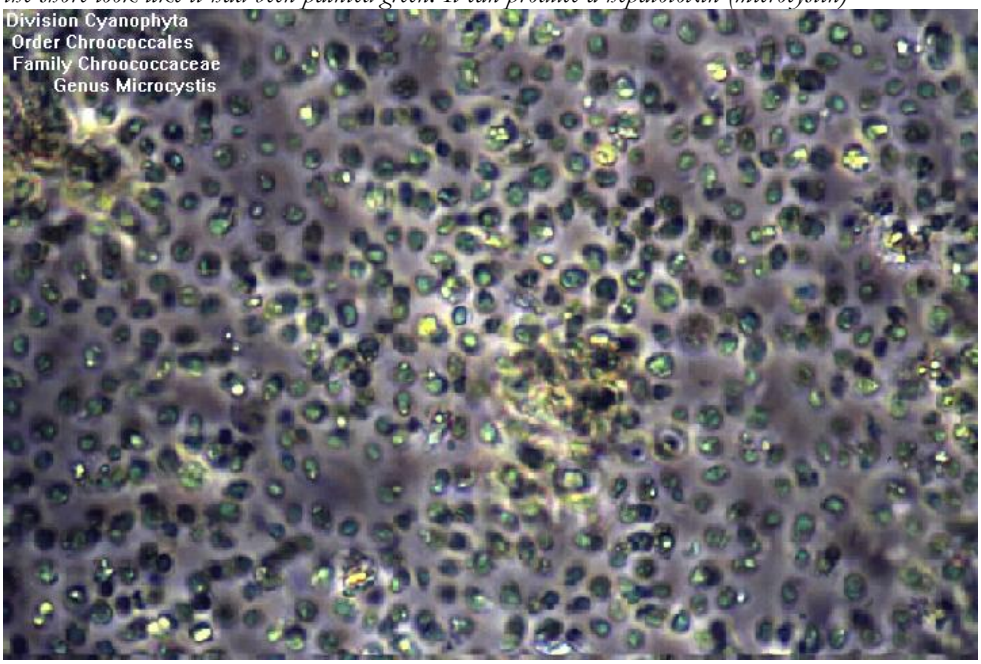
Prymnesium parvum has been found in urban lakes in the Phoenix area and in the Salt River chain of reservoirs. It produces a potent ichthyotoxin and has been implemented in several large fish kills within the state. None has ever been found in Lakeside but careful monitoring for its presence should continue.



Pteromonas and Chlorella both found in Lakeside. Both are chlorophytes and are considered ";good" unless biomass becomes excessive triggering dissolved oxygen depletion when the biomass dies back.

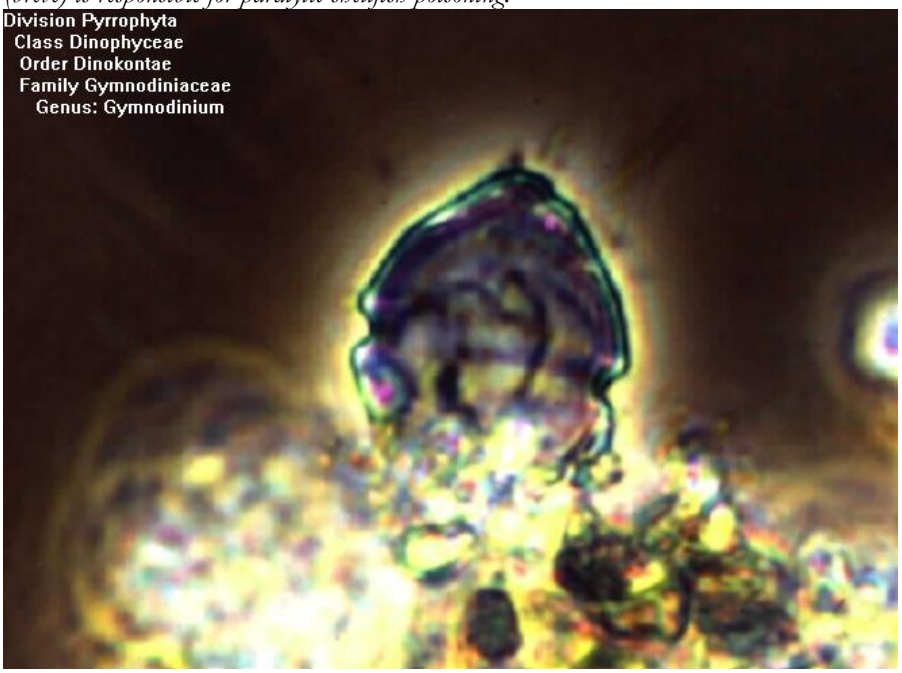


Microcystis aeruginosa found within Lakeside. This species used to occur in such high numbers within the lake to make the shore look like it had been painted green. It can produce a hepatotoxin (microcystin)

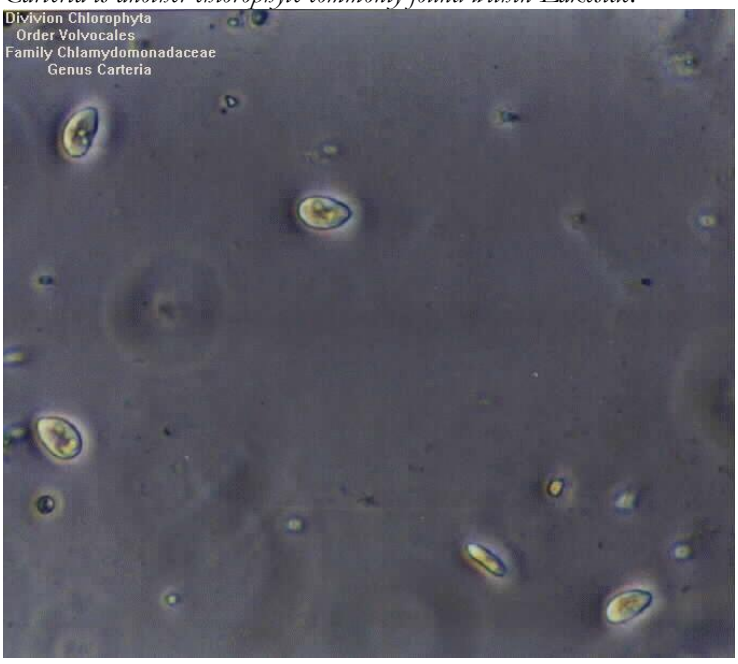


Eutreptia is a euglenoid commonly found within Lakeside. Other euglenoids commonly found include Phacus and Euglena. These species usually appear when the water is turbid due to runoff from Atterbury Wash. They have a rudimentary eyespot and are phototaxic giving them an advantage over other forms of algae in turbid water.

Gymnodinium is a dinoflagellate found in Lakeside often inter-mingled with the euglenoids. A species of Gymnodinium (breve) is responsible for paralytic shellfish poisoning.

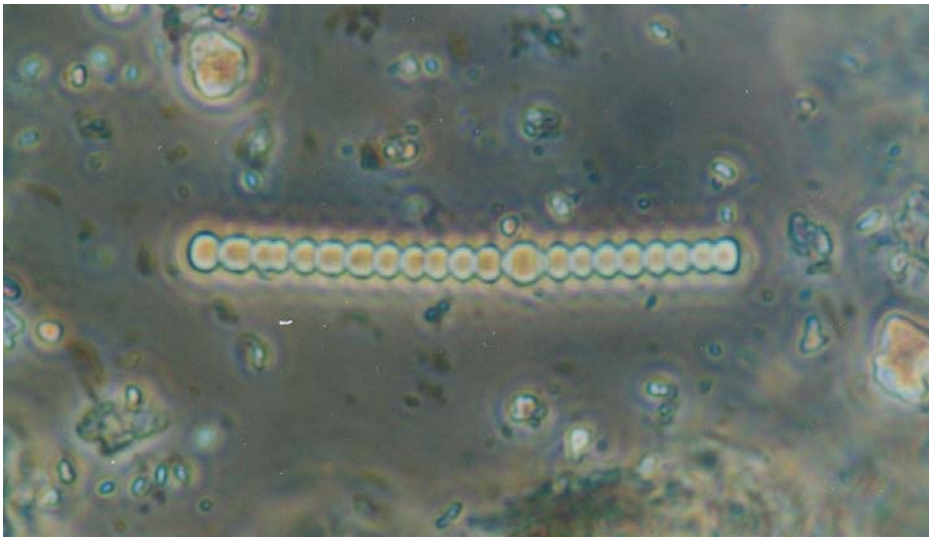


Carteria is another chlorophyte commonly found within Lakeside.

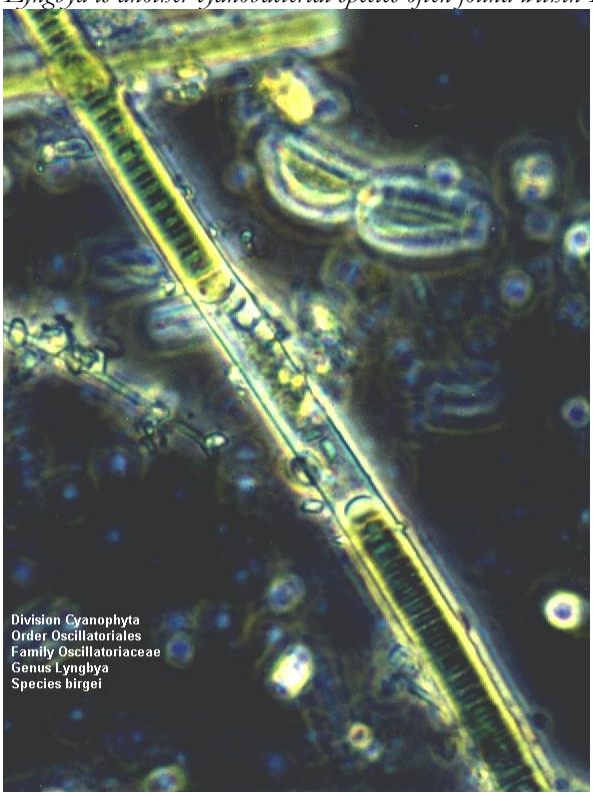


The common diatom, Fragilaria, is often found in Lakeside either as individual cells or in pseudo-filaments as shown.

The cyanobacteria Anabaena. This species, as do other cyanobacteria, has the ability to fix atmospheric nitrogen. the specialized cell (the enlarged one) is called a heterocyst where nitrogen fixation occurs.



Lyngbya is another cyanobacterial species often found within Lakeside.



SITE SPECIFIC HEALTH AND SAFETY PLAN
FOR MANAGEMENT OF LAKESIDE LAKE

PART 1 – PROJECT AND EMERGENCY INFORMATION

START DATE: 06/2007

PROJECT AND SITE NAME/LOCATION: LAKESIDE AT CHUCK FORD PARK
8300 E. STELLA ,TUCSON AZ. 85710.

CLIENT NAME AND SITE CONTACT/TELEPHONE #:

Name	*Company*	*Telephone #*	*Cell Phone #*
DAVID WALKER		326-2778	275-7110

PROJECT PERSONNEL/TELEPHONE #:

Name	*Title*	*Telephone #*	*Cell Phone #*
DAVID WALKER	RESEARCH SCIENTIST	626-2386	275-7110
CRYSTAL MORRIS	RESEARCH TECHNICIAN	626-2546	248-4414

DESCRIPTION OF SITE BACKGROUND, SCOPE, AND ASSOCIATED FIELD ACTIVITIES

SURFACE WATER SAMPLING OF LAKE FROM BOAT AT THREE TO SIX DIFFERENT LOCATIONS AND DIFFERENT DEPTHS WILL BE CONDUCTED

EMERGENCY TELEPHONE NUMBERS

CALL 911 IF THERE IS AN EMERGENCY (POLICE, AMBULANCE, FIRE)

Poison Control: (520) 626-6016 **HAZMAT Team: (520) 791-4014**

EMERGENCY CENTER

The emergency center closest to the site is *(list hospital name and address)*. The site location map is shown on Page 3 and the location and directions to the emergency center are included on Page 4.

DIRECTIONS TO EMERGENCY CENTER
Hospital Name ST. JOSEPH'S HOSPITAL
Hospital Address 350 N. WILMOT RD.
Hospital Telephone #(520) 873-3000

Directions to the hospital are as follows:

(list the directions to the hospital)
AS YOU LEAVE THE NORTHEAST PARKING LOT OF THE PARK TURN RIGHT TO GET TO STELLA. WHEN YOU REACH STELLA, TURN RIGHT YOU WILL BE HEADING WEST. CONTINUE WEST ON STELLA UNTIL YOU REACH KOLB. TURN RIGHT WHEN YOU REACH KOLB, YOU WILL BE HEADING NORTH. CONTINUE GOING NORTH UNTIL YOU REACH BROADWAY. WHEN YOU REACH BROADWAY TURN LEFT, YOU WILL BE HEADING WEST AGAIN ON BROADWAY UNTIL YOU REACH WILMOT. TURN RIGHT ON WILMOT, YOU WILL BE HEADING NORTH AGAIN. CONTINUE ON WILMOT UNTIL YOU REACH CARONDELET. WHEN YOU REACH CARONDELET TURN RIGHT AND FOLLOW THE SIGN TO THE EMERGENCY ENTRANCE TO THE HOSPITAL

Complete an Accident/Incident Report Form (included in the attachments) as soon as practicably possible. For serious injuries, the Office Director or Office Services Manager and/or the Corporate Human Resources Manager must be notified as soon as possible. Copies of accident reports will also be provided to City of Tucson Environmental Services.

PART 2 - EMERGENCY GUIDANCE

Site work will be performed by a small work group in close physical communication distances. The following communication signals will be used if there is an emergency and a worker cannot speak or cannot hear an audible communication:

1 Grasping throat with hand - **EMERGENCY - HELP ME**
2 Grasping other worker's wrist - **LEAVE AREA NOW**
3 Thumbs up - **OK - UNDERSTOOD**

Cellular telephones will be used for off-site communication. **CALL 911 IF THERE IS AN EMERGENCY (POLICE, AMBULANCE, FIRE).**

PART 3 - TRAINING

Project Personnel	Required Training and Status					
	40 Hour	**8 Hour Refresher**	**8 Hour Supervisor**	**SSO**	**FA**	**CPR**
DAVID WALKER				X		
CRYSTAL MORRIS				X		

KEY

40 Hour	=	40-hour HAZMAT course
8 Hour Refresher	=	8-hour refresher HAZMAT course
8 Hour Supervisor	=	8-hour supervisor HAZMAT course
SSO	=	Site-Specific Orientation (ALWAYS REQUIRED)
FA	=	First Aid
CPR	=	Cardiopulmonary resuscitation
Other	=	_____
X	=	Required
O	=	Not required, but desirable
*	=	Received and current

PART 4 - H&S SUPPLIES AND EQUIPMENT

Personnel who are performing fieldwork must have in their possession, at a minimum, the items listed below:

Items	Quantity
First Aid Kit	1 per person or vehicle
Listing of basic first aid procedures	1 per person or vehicle
Drinking Water	Amount appropriate for number of people, time in field, work level, temperatures, etc.
Wash and rinse water, basin or bucket, sprayer, soap, paper towels, or moistened wipes	One basin or bucket for washing and a sprayer or bucket for rinsing
Cellular telephone	At least one per work group

Personal protection equipment and monitoring are discussed in Part 6.

PART 5 – GENERAL PROJECT HAZARDS

IDENTIFICATION OF PROJECT HAZARDS

Potential hazards that may be encountered on the site during the project activities include the following: *(select hazards appropriate to project)*

_X_ Natural Hazards	_X_ Chemical Hazards
_X_ Heat/Cold Stress Hazards	__ Fire and Explosion Hazards
__ Construction Activity Hazards	__ Confined Space/Oxygen Deficiency
__ Noise Hazards	_X_ Biological Hazards
_X_ Electrical Hazards	_X_ Other BOAT SAFETY

Detailed discussions of these hazards are provided. A brief discussion of site-specific hazards is included below.

NATURAL HAZARDS

Field workers should be familiar with the basic natural hazards that may be encountered on the site. Natural hazards most likely to be encountered on the site include *(list)*. Other natural hazards that could be encountered in the Tucson area include *(list)*. People with known allergic reactions, show evidence of an allergic reaction, or receive a large number of bites or stings must seek medical attention immediately. See Attachment A for additional discussion.

The telephone number for ***Poison Control*** in the Tucson area is (520) 626-6016
The telephone number for ***Pima County Animal Control*** is (520) 743-7550

HEAT/COLD STRESS HAZARDS

Since field activities are scheduled to occur in the *(list season for project work and potential heat or cold hazards)*. Field workers must dress appropriately for the weather, drink plenty of liquids, get plenty of sleep, avoid alcoholic beverages or smoking, and acclimatize themselves to weather conditions. Workers wearing personal protective clothing are particularly susceptible to heat stress. Site personnel should be familiar with identification of heat stress victims, appropriate first-aid treatment, and the prevention of heat stress casualties. See Attachments B and C for additional discussion.

CONSTRUCTION ACTIVITY/NOISE/ELECTRICAL HAZARDS

Construction activities on the site will include *(list)*. Construction activity hazards include *(list hazards)*. Public and private underground utility surveys must be performed prior to performing subsurface investigations. Work areas must be evaluated for proximity to both underground and overhead utilities.

Call ***Arizona Blue Stake*** at 1-800-782-5348 (1-800-STAKE-IT)

In order to prevent accidents associated with excavations or other such holes in the ground resulting from site activities, slip/fall and cave-in prevention measures must be practiced by site workers. Workers are not permitted in trenches over 5 feet deep unless the sides are properly shored or sloped. Appropriate safety measures and personal protection equipment required when working with heavy machinery may include appropriate clothing, hard hats, protective footwear, and hearing protection. See Attachment D, E, G, and H for additional discussion.

CHEMICAL HAZARDS

Potential chemical hazards identified for the site project are primarily *(list chemicals)*. See Attachment F for additional discussion.

PART 6 - PERSONAL PROTECTION EQUIPMENT (PPE)

Site workers must be well acquainted with the proper use, maintenance, and decontamination of the personal protection equipment (PPE) used in the project. Only properly trained and approved workers may use respirators.

(List PPE Level to be used) PPE is considered to be adequate for this project. Conditions *(are or are not)* likely to require upgrading of the level of protection. The following PPE shall be used on site for this project:

General Hazard Category	Required PPE (be specific)	Special PPE Use Considerations
Natural Hazards		
Heat Stress		
Cold Stress		
Construction Activities		
Chemicals		

CHEMICAL HAZARDS ON SITE THAT REQUIRE PPE

Chemical hazards of primary concern on the site include *(list chemicals)*. The primary routes of exposure are *(absorption, inhalation, and/or ingestion)* The following procedures will be used to prevent exposure:

Proper sanitary and decontamination procedures

Chemical resistant gloves

Field monitoring using a photoionization detector (PID) for measuring the presence of organic vapors during site activities. Consistent PID readings between 10 and 50 units or more in the breathing zone will require cessation of activities to evaluate conditions. Control measures may include increasing dust control practices, slowing of work, or the wearing of respirators if levels cannot be reduced. Respirators will be a minimum of half-face air purifying respirator with organic vapor cartridges. Full-face respirators and dust-mist prefilter cartridges may also be used.

Respirators for ACM sampling will be a minimum of half-face air purifying respirator with HEPA cartridges

PART 7 - SANITATION, DECONTAMINATION, AND DISPOSAL

SANITATION

Toilet facilities are available on site. Locations will be identified during the site-specific orientation meeting. Appropriate decontamination procedures will be followed prior to leaving the work area.

DECONTAMINATION OPERATIONS

The following decontamination items and procedures will be adhered to during subsurface field activities that encounter potentially contaminated soils.

Personnel

Remove gloves and other disposable PPE and place in plastic trash bag. Thoroughly wash hands, arms, and face using water and Liquinox soap in a plastic bucket or using a sprayer. Dry with paper towels.

Sampling Equipment

Pre-rinse sampling equipment if there is an excessive amount of soil or sludge attached. Wash equipment using analyte-free water, Liquinox soap, and scrub brush in a plastic container. Rinse with deionized water in a plastic container and a final rinse using a water sprayer.

ACCIDENT/INCIDENT REPORT FORM (use additional pages if necessary)

Date: _____ **Time:** _____

Name: _____ **Employer:** _____

Site Name and Location: _____

Site Conditions: _____

Nature of Illness/Injury: _____

What was person doing at time of accident/incident? _____

_____

_____

What type of PPE was worn? _____

Cause of accident/incident? _____

Symptoms: _____

What immediate action was taken to prevent reoccurrence? _____

_____

_____

Actions Taken: _____

Transported By: _____

Witnessed By: _____

Facility Treating: _____

Treatment: _____

Comments: _____

_____

_____

_____

_____

_____

Employee's Signature _____ **Date** _____

Supervisor's Signature _____ **Date** _____

HEALTH AND SAFETY PLAN
REVIEW ACKNOWLEDGMENT FORM

HEALTH AND SAFETY PLAN REVIEW ACKNOWLEDGMENT FORM

DIRECTIONS: Please complete this form to show that you have reviewed the Site-Specific Health and Safety Plan (Company employees only).

Name (print)	**Signature**	**Date**

ATTACHMENTS
ATTACHMENT A
NATURAL HAZARDS - SOUTHERN AND CENTRAL ARIZONA

Investigators must be familiar with the basic natural hazards that may be encountered during the field investigation. With this knowledge, investigators can better avoid dangerous situations. Briefly, potential natural hazards in southern and central Arizona include, but are not limited to, the following:

INSECTS AND ARACHNIDS

Fire Ants, Bees and Wasps: Some people are highly allergic to stings from these insects and if so, should ask their physician for an emergency sting kit and carry it at all times. Africanized honeybees have been identified in southern Arizona. These bees are aggressive and typically attack in large numbers. Anyone receiving stings from these insects that has a history of allergic reactions, begins to show evidence of an allergic reaction, or receives a large number of stings, must seek medical attention immediately.

Spiders: Venomous spiders that are indigenous to this area include the Black Widow and the Brown Recluse. If bit by these spiders, poison control must be contacted and medical attention must be obtained. If feasible, the spider should be captured for identification purposes.

1. **Black Widows** are shiny black spiders with long legs, 3/4-inch in size. The females have an hourglass-shaped red mark on the underside of the abdomen. An ice cube may be applied to the bite to relieve pain. Bites cause painful muscle spasms in healthy adults for 2 to 4 days.

1. **Brown Spiders (Brown Recluse)** are brown spiders that are approximately 1/2- to 5/8-inch in size. They have long legs and are distinctive in that they have a dark brown fiddle-shaped marking on the underside. These spiders produce a dangerous neurotoxin that destroys tissue.

Scorpions: Arachnids with an elongated body and a narrow segmented tail bearing a venomous stinger at the tip. Scorpions are nocturnal, hiding during the day under objects such as stones or wood. A lethal species of scorpion is found in this area. Scorpion stings may be similar to a wasp or hornet or may cause severe pain. Ice may be applied to the affected area to relieve pain. Anyone stung by a scorpion must contact poison control and seek medical attention. The scorpion should be collected if possible for identification purposes.

The telephone numbers for ***Poison Control*** are:

1. Tucson area: (520) 626-6016
2. Phoenix area: (602) 253-3334
3. Outside these areas: 1-800-362-0101

ANIMALS

Rabid Animals: Various mammals may carry rabies; rabid animals tend to approach people instead of avoiding them.

Dogs: Two dogs together constitute a pack and can pose significant threat. Beware of roaming dogs, particularly large dogs that instinctively hunt on sight (e.g., Collies and Shepherds). Some breeds are notorious for erratic fits of violent behavior (e.g., Cocker Spaniels and English Springer Spaniels). Other dogs have been bred as guard dogs or fighting dogs (e.g., Dobermans, Rottweilers, Boxers, Pit Bulls, and Bulldogs).

In addition, unconfined dogs are more likely to contract rabies. Beware of dogs that are foaming at the mouth or showing their teeth. Upon encountering such a dog, do not make any sudden moves. Do not make direct eye contact with the dog. Back slowly away from the animal. Never turn your back on an unknown dog. As a rule of thumb, it is a good idea to carry a large stick for self-defense. The local County Animal Control agency must be contacted to report dog bites or dangerous animals.

Snakes: Rattlesnakes are of concern in southern and central Arizona. These snakes may or may not rattle before striking. Anyone bitten by a rattlesnake must seek medical treatment immediately. The snake will be identified if possible.

Telephone numbers for some of the ***County Animal Control*** agencies in southern and central Arizona include:

1. Pima County: (520) 743-7550
2. Maricopa County: (602) 506-7387

PLANTS

Vegetation may include plants with spines or thorns that may cause injury. A comb is helpful for removing pieces of cactus, and packing tape and tweezers are useful for removing spines or thorns.

Poison ivy is found in some areas of Arizona. The plant is characterized by leaves arranged in threes, greenish flowers, white berries, and leaves that turn yellow in the fall. The plant ranges in height from less than a foot to five feet when freestanding and taller when climbing. Contact with the oils from this plant may result in allergic reactions, including a rash and intense dermal itching.

TERRAIN

Unstable footing can be created by a variety of conditions such as steep slopes, loose rocks or sediments, or uneven ground concealed by overgrown vegetation or leaves.

- Heavy rain storms may create flash floods in normally dry washes. Stay out of low areas and DO NOT try to cross flowing washes. Flowing water may hide areas where roads have been undercut or washed out.

HEAT STRESS

Adverse weather conditions are important considerations in planning and performing on-site operations. Hot weather can cause physical discomfort, loss of efficiency, and personal injury. Heat stroke is the most severe heat-related problem. Site personnel should be familiar with identification of heat stress victims, first-aid treatment for the victim, and the prevention of heat stress casualties.

HEAT STRESS IDENTIFICATION

Heat Exhaustion

Heat exhaustion is usually characterized by an approximately normal body temperature, pale and clammy skin, profuse perspiration, tiredness, weakness, headache, nausea, and dizziness. Cramps, vomiting, and fainting are all possible. The individual should lie or sit down, with feet elevated, in an area protected from direct sunlight. The victim should be given fluids, should not engage in vigorous activity for the rest of that day, and should be careful about resuming physical activity.

Heat Stroke

The onset of heat stroke may be very rapid, and is characterized by changes in mental function, which may include confusion, irrational behavior, incoordination, delirium, and unconsciousness. Convulsions may also occur. The skin feels hot, and the body temperature is high (e.g., 106 degrees F or higher). The skin may be dry due to reduction in the body's ability to sweat. The pulse and respiratory rates are increased, and the victim usually goes into shock. The individual must be placed in the shade with feet elevated, and must be cooled using any reasonable method (removal of clothing, covering trunk and extremities with cool wet cloths, fanning). Obtain medical attention as soon as possible.

HEAT STRESS PREVENTION

Although the potential for stress is increased by wearing personal protection equipment (PPE), heat-related problems can occur with or without the added burden of this type of clothing. The following are techniques for reducing the risk of heat stress.

1 ***Drink plenty of liquids.*** To replace body fluids (water and electrolytes) lost due to sweating, drink plenty of water, commercial drink mixes along with more heavily salted food (unless on a low-salt diet). To prevent dehydration, personnel must be encouraged to drink generous amounts of water even if not thirsty. Heat-related problems can happen before the sensation of thirst occurs.

1 ***Liquids that act as diuretics (e.g., alcohol and coffee)*** should be avoided or their intake minimized prior to anticipated operations. These liquids can contribute to dehydration and subsequent heat-related problems.

2 ***Fatigue or loss of sleep*** may also predispose an individual to heat illnesses. Get plenty of sleep before a day of fieldwork.

3 ***Protective sun screens, hats, sunglasses, or appropriate clothing*** must be worn to protect the skin from sunburn.

SPECIAL CONSIDERATIONS FOR PERSONAL PROTECTIVE EQUIPMENT USE

Wearing certain personal protective clothing can increase the likelihood of heat stress, fatigue, and accidents. The major problem is caused by the interference of the protective clothing with the body's ability to cool itself. Clothing that provides a barrier against chemicals contacting the skin prevents the efficient dissipation of body heat.

Evaporation, the body's primary cooling mechanism, is reduced, because ambient air is not in contact with the skin's surface. Other heat exchange mechanisms (convection and radiation) are also impeded. Additional strain is put on the body as it attempts to maintain its heat balance. This added stress could result in health effects ranging from transient heat fatigue to serious illness or death.

The smaller the area of the body exposed to the air, the greater the probability for heat stress. Fully-encapsulating suits allow no ambient air to contact the skin's surface to aid in the evaporation of moisture; therefore, heat in these suits builds up quickly. Splash suits may allow more body surface (head, neck, and hands) to be cooled by the air, but if those areas are covered by hoods, gloves, and respirators and the joints taped, the same conditions will exist as if wearing a fully-encapsulating suit. Heat-related problems become more common as the ambient temperature rises above 70 degrees F, but can occur at much lower temperatures. Although wearing protective clothing establishes conditions that are conducive to heat-related illness, individuals vary in their susceptibility to heat stress and their ability to withstand high temperatures.

To minimize the adverse effects of physical stress, workers wearing protective clothing need to change their normal work regimen. The following measures may be utilized to reduce the effect of heat stress while wearing protective clothing:

1 Personnel must acclimatize to stressful environmental factors by varying work and rest periods as needed.

1 The intake of fluids must be maintained at adequate levels to prevent dehydration, and body electrolytes should be replaced (e.g., by drinking "Gatorade").

2 Teams of workers wearing protective clothing and/or performing extremely

arduous tasks must be rotated.

3 Work should be scheduled for cooler periods of the day when possible. In extremely hot weather, outdoor operations may be conducted in the early morning or evening.

4 Cooling devices (e.g., ice vest, pressurized backpack tanks of coolant) may be used to aid natural body ventilation. However, these devices add weight; therefore, their use will be balanced against worker fatigue. Long cotton underwear or similar garments may act as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing chemical protective clothing.

ATTACHMENT B
COLD STRESS

Frostbite is the most common injury resulting from exposure to cold. Site personnel should be familiar with the identification, prevention, and treatment of cold stress victims.

COLD STRESS IDENTIFICATION

Frostbite

Frostbite is a generally localized injury caused by freezing of body tissues. The most commonly affected areas are the nose, cheeks, ears, fingers, and toes. Early signs of frostbite may include sensations of cold or pain and flushed skin. As frostbite progresses, skin color usually changes to white or grayish-yellow and feels intensely cold and numb. The initial pain may pass, and the victim may be unaware of the frostbite. Extreme frostbite may involve an entire hand, foot, or lower leg.

Treatment of frostbite involves rewarming the frozen tissue and keeping it warm. Severe frostbite must be treated in a hospital. Upon rewarming, areas of minor frostbite may be red for several days. Areas of more severe frostbite may develop blisters, and in the most severe cases, dead tissue will turn black and separate from live tissue. Surgery may be required for reconstruction of hands or feet, or to complete separation of the dead tissue.

Hypothermia

Hypothermia is a decrease in the core temperature of the entire body. Mild hypothermia is characterized by a low body temperature, sensation of chilliness, skin numbness, minor impairment of muscular performance, and shivering. Symptoms may progress to gross muscular incoordination, mental sluggishness, and slow speech. Symptoms of severe hypothermia include cessation of shivering, severe muscular incoordination, incoherence, confusion, and irrationality. Severe hypothermia can progress to semiconsciousness, unconsciousness, or death.

Treatment for mild hypothermia includes putting on more clothing, replacing wet clothing with dry clothing, protecting workers from wind (jackets or shelters), performing vigorous

exercise, and consuming food. Measures to prevent the recurrence of hypothermia must then be taken. Severe hypothermia must be treated by medical personnel in a hospital.

COLD STRESS PREVENTION

1. ***Be aware of weather conditions.*** Cold stress from exposure depends on factors such as wind velocity, type and duration of exposure, temperature, and humidity. Frostbite is accelerated by high winds or humidity, low body resistance, and tiredness.

2. ***Wear appropriate protective clothing.*** Appropriate protective clothing and its proper use are essential for preventing cold stress. Multiple layers are most effective, consisting of a windproof outer layer, and successive inner layers that allow an air space of about one-quarter inch between them. Sweating must be avoided to prevent loss of insulation value of the clothing and to prevent heat loss through perspiration. Therefore, layers should be opened or removed as soon as activity begins in order to prevent clothing from being moistened, and the clothing should be replaced when the activity ceases. Wool, down (when dry), polyester fibers, and polypropylene materials are the best insulating materials for clothing. Appropriate hand, foot, and headgear must also be considered (e.g., mittens, insulated leather boots, extra socks, and wool caps).

3. ***Drink adequate amounts of liquids.*** Dehydration increases the probability of frostbite, decreases the ability to warm the body by exercise, and may contribute to other health problems.

4. ***Do not drink alcoholic beverages or smoke.*** These activities constrict the blood vessels in the skin and may aggravate local cold injuries.

Eat foods at frequent intervals to help prevent the depletion of energy stores needed for physical activity and heat production. Inadequate food intake may contribute significantly to hypothermia.

ELECTRICAL HAZARDS

Potential electrical hazards at a typical work site include underground utility cables, overhead utility cables, and lightning. Underground and overhead utility cables were discussed earlier in this section. Lightning, a significant danger during outdoor operations, can be particularly hazardous for workers handling metal containers or equipment. To protect workers from lightning, weather conditions must be monitored, and work suspended during electrical storms. Downed power lines may also be of concern during storms that produce strong winds.

NOISE HAZARDS

Work around large equipment often creates excessive noise. Negative effects of noise include:

1. Workers being startled, annoyed, or distracted;

2. Physical damage to the ear, pain, and temporary and/or permanent hearing loss;

and

3 Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

Protection against the effects of noise exposure should be provided when the sound levels exceed those shown in the table below (from 29 CFR Part 1910.95) when measured on the A-scale of a standard sound level meter at slow response.

PERMISSIBLE NOISE EXPOSURES

Duration, per day, hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Thus, if employees are subjected to noise exceeding an 8-hour time-weighted-average sound level of 90 dBA (decibels on A-weighted scale) or other levels outlined in the above table, feasible administrative or engineering controls must be used.

In addition, whenever employee noise exposures equal or exceed an 8-hour time-weighted-average sound level of 85 dBA, employers must administer a continuing, effective hearing conservation program as described in OSHA regulation 29 CFR Part 1910.95.

HAZARD IDENTIFICATION

Potential noise hazards associated with this site include (list below):
N/A

PERSONAL PROTECTION

Will special protection be required to prevent noise from interfering with work?
___YES **_X_NO**

If yes, list the hearing protection that will be used during the project.

COMMUNICATION

Will the noise be prolonged and continuous, thereby causing problems with communications?
___YES __X__NO

If yes, list the alternative forms of communication that will be established (e.g. two way radios, hand signals):

CHEMICAL HAZARDS

SIGNS OF EXPOSURE TO CHEMICALS

Precautions will be taken to avoid potential exposure to hazardous materials; however, if an exposure does occur, signs and symptoms chemical exposure may include:

4 Behavioral changes
5 Breathing difficulties
6 Changes in complexion or skin color
7 Coordination difficulties
8 Coughing
9 Dizziness
10 Drooling, pupillary response
11 Diarrhea
12 Fatigue and/or weakness
13 Irritability
14 Irritation of eyes, nose, respiratory tract, skin or throat
15 Headache
16 Light-headedness
17 Nausea
18 Sneezing
19 Sweating
20 Tearing
21 Blurred vision
22 Cramps
23 Tightness in the chest

If an exposure to chemical materials is suspected, the victim must receive prompt medical attention.

MEDICAL MONITORING

Employees who may be exposed to hazardous materials at levels of concern as part of their jobs are required to participate in a medical monitoring program, consisting of the following examinations:

24 Baseline Examination – Includes a basic physical, pulmonary function testing as well as HAZMAT testing if a new worker shows a history of previous HAZMAT exposure, and/or if the worker plans to enter into HAZMAT work.

25 Medical Surveillance – Program involves annual exams to check on worker

health for those involved in HAZMAT work, and includes a basic physical, routine pulmonary function testing and may include chemical blood screening.

26 Exit Examination – For employees in the medical monitoring program who are leaving the company.

Project workers should note the potential hazardous materials and should discuss their known or suspected chemical exposures from various projects with the physician during the medical examination. Upon completion of the examination, the physician will provide the employee with the results derived from the examination as well as a confidential copy to the employer.

If project workers are exposed to chemicals during the site activities, the workers will receive medical examinations and/or testing in accordance with the exposure. The specific content of a medical examination will largely depend on the target organs of the hazardous substance, the likely longevity of the material in the body, and the cumulative HAZMAT exposures of a particular individual. The following is a list of general classes of testing/medical examinations as a result of working a project.

Aromatic hydrocarbon screening (e.g., medical exam with focus on liver, kidney, nervous system, and skin; complete blood count [CBC]; platelet count; measurement of kidney and liver function)

27 Halogenated aliphatic hydrocarbon screening (e.g., medical exam with focus on the liver, kidney, nervous system, and skin; testing of liver and kidney function; carboxyhemoglobin)

28 Asbestos screening (e.g., medical exam with focus on lungs and gastrointestinal system; stool test for occult blood; pulmonary function test; chest X-ray)

29 Heavy metals screening (e.g., medical exam with focus on possible symptom clusters; metals screening in blood, urine, and/or tissues; CBC; measurement of kidney and liver function; chest X-ray or pulmonary function testing)

30 Herbicide screening (e.g., medical exam with focus on skin and nervous system; measurement of kidney and liver function; urinalysis)

31 Organophosphate and carbamate insecticide screening (e.g., physical exam focusing on the nervous system, cholinesterase screening, measurement of delayed neurotoxicity and other effects)

32 Organochlorine insecticide screening (e.g., medical exam with focus on the nervous system; measurement of kidney and liver function; CBC for exposure to chlorocyclohexanes)

33 PCB screening (e.g., skin and liver exam, serum PCB levels, triglycerides, liver function measurement)

FIRE AND EXPLOSION HAZARDS

BACKGROUND INFORMATION

Fire and explosion hazards are common concerns for many project sites. Workers will be made aware of potential fire and/or explosion hazards and instructed in standards for proper conduct when working in areas with these hazards.

One of the more common fire and explosion hazards involves volatile substances such as methane, hydrogen sulfide, as well as other explosive chemicals that may be present on a site. Each volatile substance has an explosion and flammability range that is between the lower explosive limit (LEL) and upper explosive limit (UEL) for that substance. The LEL of a substance is the minimum concentration of gas or vapor in air below which the substance will not burn when exposed to a source of ignition. This concentration is usually expressed in percent by volume. Below this concentration, the mixture is too "lean" to burn or explode. The UEL of a substance is the maximum concentration of gas or vapor above which the substance will not burn when exposed to a source of ignition. Above this concentration, the mixture is too "rich" to burn or explode.

Thus, the flammable range is the range of concentrations between the LEL and UEL where the gas-air mixture will support combustion, thereby presenting a hazardous situation. The flashpoint of a substance is the minimum temperature at which it gives off sufficient vapor to form an ignitable mixture with the air just above the surface of the substance. Ignition of a substance at the flashpoint is not continuous. The ignition temperature or autoignition temperature is the minimum temperature required to initiate or cause self-sustained combustion without an ignition source.

When evaluating the fire or explosion potential at a site, all equipment used will be intrinsically safe or explosion-proof. Where flammable or explosive atmospheres are detected, ventilation may dilute the mixture to below the LEL. However, ventilation is generally not recommended if concentrations exceed the UEL, since the mixture will pass through the flammable/explosive range as it is diluted. Note that combustible gas indicator readings may not be accurate when oxygen concentrations are less than 19.5 percent (excerpt taken from the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* document by NIOSH/OSHA/USCG/EPA). Refer to the *NIOSH Pocket Guide to Chemical Hazards* for guidance on determining the LEL and UEL for chemicals or volatile substances.

HAZARDOUS WASTE SITES

There are many potential causes of explosions and fires at hazardous waste sites:

1. Chemical reactions that produce explosion, fire, or heat;
2. Ignition of explosive or flammable chemicals;
3. Ignition of materials due to oxygen enrichment;
4. Agitation of shock- or friction-sensitive compounds; and
5. Sudden release of materials under pressure (e.g., drums).

Explosions and fires may arise spontaneously. However, more commonly, they result from site activities, such as moving drums, accidentally mixing incompatible chemicals,

or introducing an ignition source (such as a spark from equipment) into an explosive or flammable environment. At hazardous waste sites, explosions and fires not only pose the obvious hazards of intense heat, open flame, smoke inhalation, and flying objects, but also may cause the release of toxic chemicals into the environment. Such releases can threaten both personnel on site and members of the general public living or working nearby (excerpt from the 1985 *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* by NIOSH, OSHA, USCG, and EPA).

SAFETY PROCEDURES FOR BORINGS, WELL DRILLING, AND WELL CONSTRUCTION

The precautions presented below are focused primarily on hazards associated with landfill gas.

4 Smoking is not permitted within 50 feet of a boring. In general, smoking is not advisable at a landfill.

5 Fire extinguishers must be available during drilling (two 20:A-80:BC extinguishers are recommended). The drilling crew should be alert for the potential of the drill auger to spark against rock or metal causing a serious fire in the boring. For example, landfill gas (LFG) will typically burn almost invisibly under such circumstances. Fires will be extinguished by covering the boring with earth materials by using earth-moving equipment. As a contingency before drilling, arrangements may be made to have a loader or equivalent equipment available or on call in case of a boring fire.

6 Any personnel working near the edge of a well (greater than 12 inches in diameter) under construction must wear a parachute-type harness and safety line tied to an immobilized drill rig or some other safe, immobilized structure, and/or work with a drilling platform in place. Due to the typically oxygen deficient environment "down hole," an individual who fell "down hole" even a short distance would likely not survive until recovered. For this reason, all individuals near the drilling activities must be tethered.

7 No worker will be allowed to work alone at any time near the edge of the well under construction. At least one other worker must be present beyond the areas considered to be subject to the possible effects of hazardous vapors (e.g., LFG) or cave-in. The number of persons working near the boring also will be limited to only the number necessary to accomplish the task; however, there must be a sufficient number of workers present nearby to remove an injured worker or summon help.

8 For drilling at a landfill, special consideration must be given to the less stable conditions represented by refuse in relation to compacted soil. Refuse must be considered more prone to instability that may cause sidewall failure of the boring at any time. If this were to occur, the magnitude of the failure could be substantial; and individuals present at the time of failure could be buried in an oxygen-deficient environment. It is imperative that the personnel performing drilling work remain alert to changing subsurface conditions and signs of impending physical failure such as fissures, etc. It is not uncommon to experience a "hollowing out" effect creating a cavity at depth much larger than

the boring due to side wall failure "down hole." This could cause a sudden collapse to occur at the surface. It should be remembered that the drill rig can exert a large and vibratory force at the surface in the vicinity of the boring.

9 Drilling personnel must be alert to the potential for encountering subsurface hazards, particularly in older landfills where screening of disposal materials may have been less controlled. Although rare, a variety of hazardous situations have been encountered while drilling in landfills especially near military or chemical processing facilities. These potential hazards may include:

1 Unknown hazardous chemicals in drums or containers (e.g., combustible or explosive, reactive, toxic or corrosive materials)

2 Munitions

3 Asbestos

4 Compressed gas cylinders (CGCs)

5 Biomedical waste

6 Radioactive waste

If such suspect materials are encountered, contact with them will be avoided and appropriate adjustments made in the health and safety plan requirements.

10 Periodically during well construction at a landfill, the work area will be monitored for levels of methane, hydrogen sulfide, vinyl chloride, benzene, and/or other volatile organic chemicals.

11 If the well construction is not completed by the end of the working day, the hole must be covered with a plate of sufficient overlap to prevent access to the hole and sufficient thickness and structural strength to support expected loads, and the plate must be weighted down to discourage removal. The edges of the plate must be covered with a sufficient quantity of wet or moist soil to prevent gas from escaping. Barricades must be placed around the covered hole outside the range of possible cave-ins. All pipes must be capped at the end of each workday.

12 When working at a landfill, use equipment and tools that are non-sparking and/or explosion proof (e.g., only explosion-proof electric or hand-powered drills will be used when drilling to install LFG collection system piping containing LFG). Electrical equipment must meet the requirements for Class I, Division 2, Group D, (Methane), rated equipment in accordance with the National Electric Code (NEC). In addition, other safe equipment may include pneumatically and hydraulically driven equipment.

13 In hydraulic power tools use fire-resistant fluid capable of retaining its operating characteristics at extreme temperatures, in case a heat source is encountered.

14 All on-site internal combustion engines should have spark arrestors that meet requirements for hazardous (e.g., ignitable) atmospheres. Refueling must take

place in safe areas. Do not fuel engines while a vehicle is running and prohibit ignition sources in the fuel area.

15 An exhaust hood can be used to control venting LFG vapors while drilling to reduce personnel and environmental exposure. This is mandatory in some locales.

16 Workers must use protective clothing as needed to protect them from chemicals and/or disease-causing agents found at landfills.

17 Keep heavy equipment that is used in the Exclusion (Contaminated/Hazardous) Zone in that zone until the job is done. Decontaminate such equipment before moving it into the clean zone.

ENTRY OF CONFINED SPACES

In general, a confined space is an area large enough and so configured that a worker can bodily enter and perform assigned work. However, the area has a limited or restricted means of entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, and crawl spaces) and is not designed for continuous occupancy. Confined spaces are dangerous due to the potential for ignitable concentrations of combustible gases, oxygen deficiency, or elevated concentrations of hazardous or toxic chemicals.

Confined spaces at a work site must be evaluated by the Project Manager or Health and Safety Representative to determine if it is a permit required space. Confined spaces will not be entered by unauthorized personnel and the entryway will be posted with danger signs. A Confined Space Entry Permit must be completed prior to entrance of the permit confined space. Before entry begins, the entry supervisor identified on the permit must verify that all necessary precautions have been taken, and then sign the permit to authorize entry. The entry permit will be posted at the entrance during the operations, and will be terminated by the supervisor once operations covered by the permit have been completed or unallowed conditions occur. Each confined space situation must be evaluated and handled in a site-specific manner, using detailed guidelines oriented to the characteristics of the specific confined space.

BIOLOGICAL HAZARDS

For the purposes of this health and safety plan, biological hazards are defined as bacteria and viruses that may cause human diseases. Other biological hazards that may be present at almost any site include poisonous plants, insects, and animals (included in the Natural Hazards Attachment, if applicable).

Some projects (e.g., waste sorts, septic tank removal) may involve the potential for workers to come in contact with various materials that may have disease-causing agents, such as discarded hypodermic needles, blood products, and used contraceptive devices.

HAZARD PROTECTION

To protect against biological hazards, workers should minimize contact with wastes. A minimum of Level D protective clothing (e.g., coveralls, boots, splash glasses or goggles, and gloves) is recommended. For example, the March 1991 SWANA Health and Safety Guidelines recommends use of a Tyvek suit, appropriate gloves and boots, and a NIOSH-approved respirator with a high-efficiency particulate air (HEPA) filter cartridge for solid waste sort projects. Protective equipment will be considered appropriate only if it does not permit potentially infectious materials to pass through or reach the worker's clothing, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used.

At a minimum, reusable personal protective equipment will be decontaminated with a peroxide solution. Before going to lunch or leaving the work site for the day, workers must wash their hands and face thoroughly with warm water and an antibacterial soap.

Tetanus shots are recommended at prescribed intervals for all personnel involved in these field activities. Vaccination for hepatitis B may also be appropriate for personnel at risk of exposure to biological materials.

EXPOSURE INCIDENTS

Due to the potentially high chance of infection, cuts or abrasions incurred at project sites with potential biological hazards must be treated immediately by a qualified health practitioner, especially when working at sites such as landfills.

Exposure incidents are defined as eye, mouth, other mucous membrane, non-intact skin, parenteral (piercing of mucous membranes or skin barrier by needlesticks, cuts, abrasions, etc.), or other exposure to blood or other potentially infectious materials. If exposure occurs, personal protective equipment must be removed and the affected body area washed immediately with soap and water. Eyes, nose, or other mucous membranes must be flushed with water if they have been exposed. A post-exposure medical evaluation and follow-up will be made available for the worker immediately following the incident.

Appendices

Draft AZPDES Permit for Lakeside Park Lake

AZPDES Fact Sheet for Lakeside Lake

Section VII from the Draft Sampling and Analysis Plan for the ADEQ Lakes Program.

Janet Napolitano
Governor

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

10 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Stephen A. Owens
Director

January 17, 2005

Francis LaSala
City of Tucson
Environmental Services
100 N. Stone Ave. – 2nd Floor
Tucson, AZ 85701

Re: Lakeside Park Lake
Draft AZPDES Permit No. AZ0024201

Dear Mr. LaSala:

Enclosed is a copy of the preliminary draft permit and fact sheet for this facility. Please review and advise us of any comments you may have at this time. This informal review period will extend for 30 days from the date of this letter. If we do not receive comments within 30 days, we will proceed with the public notification process.

If you have any questions concerning these draft documents, please call me at (602) 771-4689 or email me at dd2@ev.state.az.us.

Sincerely,

Debra Daniel

Debra Daniel
Surface Water Permits Unit
Water Permits Section

cc: Carrie Marr, U.S. Fish and Wildlife Service
Robert Broscheid, Arizona Department of Game and Fish

Enclosures: Draft Permit
Draft Fact Sheet

SWPU06: 0004

ADEQ Inventory No. 105642
LTF No. 37367

Permit No. AZ0024201

AUTHORIZATION TO DISCHARGE UNDER THE ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Article 3.1; the Federal Water Pollution Control Act, (33 USC § 1251 et. seq., as amended), and Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 9 and 10, and amendments thereto,

City of Tucson
Lakeside Park Lake
100 N Stone Ave – 2nd Floor
Tucson, AZ 85701

is authorized to discharge treated domestic wastewater from the City of Tucson Reclaimed Water System and groundwater from well PK 009 to Lakeside Lake located in Tucson, Arizona:

Outfall No.	Latitude	Longitude	Legal
001- discharge from Lakeside Park Lake Groundwater Well	32° 11' 15" N	110° 48' 57" W	Township 14 S, Range 615 E, Section 28
002- discharge from Tucson Reclaimed Water System	32°11' 15" N	110°48' 57" W	Township 14 S, Range 615 E, Section 28

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein, and in the attached "Standard AZPDES Permit Conditions," dated February 2, 2004.

This permit shall become effective on _____, 2006.

This permit and the authorization to discharge shall expire at midnight, _____, 2011

Signed this _____ day of _____. 2006.

Joan Card, Director
Water Quality Division
Department of Environmental Quality

TABLE OF CONTENTS

PART I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. The permittee shall limit and monitor discharges from outfall 001 and 002 as specified in Table 1 and 1A which follow. These requirements are based on a flow of 518.6 m^3/day (0.137 MGD) for Outfall 001 and a flow of 927.4 m^3/day (0.245 MGD) for Outfall 001.

TABLE 1: Effluent Limitations and Monitoring Requirements for Outfall 001

Parameter	Maximum Allowable Discharge Limitations				Monitoring Requirement (2)	
	Mass Limits		Concentration Limits			
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Monitoring Frequency	Sample Type
Discharge Flow (MGD)	REPORT (1)	REPORT	---	---	Continuous	Estimated
pH (3)	Not less than 6.5 standard units (S.U.) nor greater than 9.0 S.U.				Once/week	Discrete

Footnotes
(1) Monitoring and reporting required. No limit set at this time.
(2) At a minimum, one sample must coincide with one of the required Whole Effluent Toxicity Test (WET) samples. See Part IV of the permit.
(3) pH must be measured at the time of sampling and does not require use of a certified laboratory.

TABLE 1a: Effluent Limitations and Monitoring Requirements for Outfall 002

Parameter	Maximum Allowable Discharge Limitations				Monitoring Requirement (4) (9)	
	Mass Limits		Concentration Limits			
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Monitoring Frequency	Sample Type (4)
Discharge Flow (MGD)	REPORT (1)	REPORT	---	---	Continuous	Estimated
Ammonia (5)	(2)	(2)	(2)	(2)	Weekly	Discrete
Copper	0.006 kg/day	0.016 kg/day	8.6 ug/L	17 ug/L	Monthly	8-hour composite
Cyanide	0.007 kg/day	0.015 kg/day	7.9 ug/L	16 ug/L	Monthly	Discrete
Dissolved Oxygen	(1)	(1)	(1)	(1)	Weekly	Discrete
E. Coli (3)	---	---	126 cfu/100 mL (3)	576 cfu/100 mL(3)	Weekly	Discrete
Ortho-phosphorous	(1)	(1)	0.009 mg/L (2)	0.009 mg/L (2)	Weekly	8-hour composite
Total Phosphorous	---	0.0004 kg/day	---	0.4 mg/L	Weekly	8-houir composite
Total Residual Chlorine	.0284 kg/day	.0625 kg/day	4 ug/L (2)	8 ug/L (2)	Weekly	Discrete
Temperature (5)	---	---	(1)	(1)	Weekly	Discrete
pH (5)(6)	Not less than 6.5 standard units (S.U.) nor greater than 9.0 S.U.				Once/week	Discrete

(1) Monitor and report.
(2) A mixing zone has been granted for this parameter. See Table 1.b below and Part IV.
(3) Results may also be reported as mpn. The monthly average for E. Coli is calculated as a geometric mean. A minimum of 4 samples are required in order to report a geometric mean. See the definition for "Monthly or Weekly Average Concentration Limit" in Appendix A.
(4) For purposes of this permit an '8-hour composite' sample has been defined as a flow-proportioned mixture of not less than two discrete aliquots obtained at equal time intervals for the duration of the discharge or over a period of 8 hours, whichever is shorter. The volume of each aliquot shall be directly proportional to the discharge flow rate at the time of sampling.
(5) At a minimum, one sample must coincide with one of the required Whole Effluent Toxicity Test (WET) samples. See Part IV of the permit.
(6) pH must be measured at the time of sampling and does not require use of a certified laboratory.

B. In Lake Limitations

The permittee shall limit and monitor the water quality in the Lake in accordance with Table 1.b which follows. Additional information on mixing zone monitoring is given in Part VI.A.

TABLE 1b: Effluent Limitations and Monitoring Requirements for Lake Locations

Parameter	Maximum Allowable In Lake Limitations				
	Concentration Limits			Monitoring Requirement	
	Monthly Average	Daily Maximum	Location where Limit is Applied	Monitoring Frequency	Sample Type (3)
Ammonia	Monitor and Report (1) Limit set	Monitor and Report (1) Limit set	Daily Maximum applies at edge of the acute mixing zone Monthly Average applies at edge of chronic mixing zone	Weekly	Discrete at multiple locations (3)
Chlorophyll-a	---	< 50 ug/L	All points of Lake	Monthly during period of reclaimed water discharge (2)	Discrete at multiple locations (3)
Dissolved Oxygen (within 1 m of the surface)	---	6.0 mg/L	All surface points of the Lake	Weekly	Discrete at multiple locations (3)
Dissolved Oxygen (depth (3))	---	2.0 mg/L	All depth locations of the Lake	Weekly	Discrete at multiple locations (3)
Nitrate/Nitrite	---	Monitor and Report	---	Weekly	Discrete at multiple locations (3)
Orthophosphorous	---	0.009 mg/L	At edge of the chronic mixing zone	Weekly	Discrete at multiple locations (3)
Total Phosphorous	---	Monitor and Report	---	Weekly	Discrete at multiple locations (3)
Total Residual Chlorine	0.004 mg/L	0.008 mg/L	Daily Maximum -at edge of the acute mixing zone Average monthly -at edge of chronic mixing zone	Weekly	Discrete at multiple locations (3)
pH (1)	Not less than 6.5 standard units (S.U.) nor greater than 9.0 S.U.		---	Weekly	Discrete at multiple locations (3)
Temperature (1)	---	Monitor and Report	---	Weekly	Discrete at multiple locations (3)
Whole Effluent Toxicity (WET)	See Table 4 below and Part III of this permit for WET requirements..				

(1) The ammonia standards are dependent on temperature and pH. Temperature and pH must be monitored at the time ammonia samples are collected. All data must be reported on the Ammonia Data Report form in Appendix C. Limits are set for the mixing zone. See mixing zone conditions (Part IV.A) for sampling locations.
(2) First sample after reclaimed water discharge to lake begins (typically in the early summer) and monthly there after until discharge ends (typically in the early fall).
(3) See Part VI. for specific monitoring locations.

C. Trace Substance Monitoring

The permittee shall monitor discharges from outfall 001 and 002 as specified in Tables 2a and 2b. Data results above the Assessment Levels (ALs) listed do not constitute a permit violation, but may trigger evaluation of Reasonable Potential by ADEQ. The permittee shall use an approved analytical method with a Method Detection Limit (MDL) lower than the AL values per Part II.A.5.

TABLE 2a: Trace Substance Monitoring Requirements Outfall 001

Parameter	ASSESSMENT LEVELS (1) (4) Concentration (µg/L)		Monitoring Requirements (2)	
	Monthly Average	Daily Maximum	Monitoring Frequency	Sample Type
Beryllium	4.3	8.7	2X during the discharge season (5)	Discrete
Cadmium (3)	2.2	4.5	2X during the discharge season (5)	Discrete
Chromium VI	8	16	2X during the discharge season (5)	Discrete
Copper (3)	8.6	17	2X during the discharge season (5)	Discrete
Cyanide	7.9	16	2X during the discharge season (5)	Discrete
Lead (3)	2.7	5.5	2X during the discharge season (5)	Discrete
Mercury	0.008	0.016	2X during the discharge season (5)	Discrete
Oil and grease	10000	15000	2X during the discharge season (5)	Discrete
Selenium	2	3	2X during the discharge season (5)	Discrete
Silver (3)	2.7	5.4	2X during the discharge season (5)	Discrete
Sulfides	50	100	2X during the discharge season (5)	Discrete
Thallium	1.2	11	2X during the discharge season (5)	Discrete
Hardness ($CaCO_3$) (3)	Report	Report	2X during the discharge season (5)	Discrete

Footnotes:
(1) Concentration values are calculated based on Arizona Water Quality Standards. Monitoring and reporting required.
(2) At a minimum, one sample must coincide with one of the WET samples taken annually. See Part IV of the permit.
(3) Assessment levels listed are based on a hardness of 130 mg/L as $CaCO_3$. The receiving water must be tested for hardness at the same time that these metal samples are taken. Samples shall be taken at the background location. Please see the hardness definition in Appendix A. Part B.
(4) All metals effluent Assessment Levels are for total recoverable metals, except for Chromium VI, for which the assessment levels listed are dissolved.
(5) The discharge season for groundwater discharges to the Lake is typically from April to mid-September, but will vary by year based on temperature and precipitation

TABLE 2b: Trace Substance Monitoring Requirements Outfall 002

Parameter	ASSESSMENT LEVELS (1) (4) Concentration (µg/L)		Monitoring Requirements (2)	
	Monthly Average	Daily Maximum	Monitoring Frequency	Sample Type
Cadmium (3)	2.2	4.5	2X during the discharge season (5)	8 hour composite
Chromium VI	8	16	2X during the discharge season (5)	8 hour composite
Lead (3)	2.7	5.5	2X during the discharge season (5)	8 hour composite
Mercury	0.008	0.016	2X during the discharge season (5)	8 hour composite
	10000	15000	2X during the discharge season (5)	8 hour composite
	2	3	2X during the discharge season (5)	8 hour composite
	2.7	5.4	2X during the discharge season (5)	8 hour composite
	50	100	2X during the discharge season (5)	8 hour composite
	Report	Report	2X during the discharge season (5)	Discrete

Footnotes:
(1) Concentration values are calculated based on Arizona Water Quality Standards. Monitoring and reporting required.
(2) At a minimum, one sample must coincide with one of the WET samples taken annually. See Part IV of the permit.
(3) Assessment levels listed are based on a hardness of 130 mg/L as $CaCO_3$. The receiving water must be tested for hardness at the same time that these metal samples are taken. Samples shall be taken at the background location given in Part IV.C. Please see the hardness definition in Appendix A. Part B.
(4) All metals effluent Assessment Levels are for total recoverable metals, except for Chromium VI, for which the assessment levels listed are dissolved.
(5) The discharge season for reclaimed water discharges to the Lake is typically from early summer to fall, but will vary by year based on temperature and precipitation

The permittee shall characterize the discharge from Outfall 001 and 002 by monitoring for the parameters listed in Tables 3.a. – 3.f. No limits or ALs are established, but the reporting level must be low enough to allow comparison of the results to the applicable water quality standards (WQS). If

a reporting level below the WQS cannot be achieved, then the permittee shall use the method with the lowest method-specific MDL, as defined in Appendix A of this permit. Samples are to be representative of any seasonal variation in the discharge:

TABLE 3.a: Effluent Characterization Testing

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency (1)	Sample Type
Temperature (2)	°Celcius	Annually	Discrete
Ammonia (as N)	mg/L	Annually	Discrete
Chlorine (total residual) TRC	mg/L	Annually	Discrete
Dissolved oxygen (2)	mg/L	Annually	Discrete
E. Coli	Cfu or mpn	Annually	Discrete
Kjeldahl Nitrogen, Total	mg/L	Annually	Discrete for 001/ 8-hour Composite for 002
Nitrate/Nitrite (as Total N)	mg/L	Annually	Discrete for 001/ 8-hour Composite for 002
Oil and grease	mg/L	Annually	Discrete
Orthophosphorus	mg/L	Annually	Discrete
Total Phosphorus	mg/L	Annually	Discrete for 001/ 8-hour Composite for 002
Total dissolved solids	mg/L	Annually	Discrete for 001/ 8-hour Composite for 002

(1) If more frequent monitoring of any of these parameters is required by another part of this permit, those sampling results may be used to satisfy Table 3.a. requirements.
(2) Temperature and dissolved oxygen must be measured at the time of sampling and do not require use of a certified laboratory.

TABLE 3.b: Effluent Characterization Testing - Selected Metals (Total Recoverable)

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency (1)	Sample Type
Antimony	ug/L	Annually	8-hour Composite
Arsenic	ug/l	Annually	8-hour Composite
Beryllium	ug/L	Annually	8-hour Composite
Cadmium	ug/l	Annually	8-hour Composite
Chromium	ug/l	Annually	8-hour Composite
Chromium VI	ug/l	Annually	Discrete
Copper	ug/l	Annually	8-hour Composite
Lead	ug/L	Annually	8-hour Composite
Mercury	ug/l	Annually	8-hour Composite
Nickel	ug/L	Annually	8-hour Composite
Selenium	ug/l	Annually	8-hour Composite
Silver	ug/l	Annually	8-hour Composite
Thallium	ug/l	Annually	8-hour Composite
Zinc	ug/l	Annually	8-hour Composite
Cyanide	ug/l	Annually	Discrete

(1) If more frequent monitoring of any of these parameters is required by another part of this permit, those sampling results may be used to satisfy Table 3.b. requirements.

TABLE 3.c: Effluent Characterization Testing - Selected Volatile Organic Compounds

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency (1)	Sample Type
Acrolein	ug/L	once /year 2,3,4	8-hour Composite
Acrylonitrile	ug/L	once /year 2,3,4	8-hour Composite
Benzene	ug/L	once /year 2,3,4	8-hour Composite
Bromoform	ug/L	once /year 2,3,4	8-hour Composite
Carbon tetrachloride	ug/L	once /year 2,3,4	8-hour Composite
Chlorobenzene	ug/L	once /year 2,3,4	8-hour Composite
Chlorodibromomethane	ug/L	once /year 2,3,4	8-hour Composite
Chloroethane	ug/L	once /year 2,3,4	8-hour Composite
2-chloroethylvinyl ether	ug/L	once /year 2,3,4	8-hour Composite
Chloroform	ug/L	once /year 2,3,4	8-hour Composite
Dichlorobromomethane	ug/L	once /year 2,3,4	8-hour Composite
1,1-dichloroethane	ug/L	once /year 2,3,4	8-hour Composite
1,2-dichloroethane	ug/L	once/year 2,3,4	8-hour Composite
Trans-1,2-dichloroethylene	ug/L	once /year 2,3,4	8-hour Composite
1,1-dichloroethylene	ug/L	once /year 2,3,4	8-hour Composite
1,2-dichloropropane	ug/L	once /year 2,3,4	8-hour Composite
1,3-dichloropropylene	ug/L	once/year 2,3,4	8-hour Composite
Ethylbenzene	ug/L	once /year 2,3,4	8-hour Composite
Methyl bromide	ug/L	once /year 2,3,4	8-hour Composite
Methyl chloride	ug/L	once /year 2,3,4	8-hour Composite
Methylene chloride	ug/L	once /year 2,3,4	8-hour Composite
1,1,2,2-tetrachloroethane	ug/L	once /year 2,3,4	8-hour Composite
Tetrachloroethylene	ug/L	once /year 2,3,4	8-hour Composite
Toluene	ug/L	once /year 2,3,4	8-hour Composite
1,1,1-trichloroethane	ug/L	once /year 2,3,4	8-hour Composite
1,1,2-trichloroethane	ug/L	once /year 2,3,4	8-hour Composite
Trichloroethylene	ug/L	once /year 2,3,4	8-hour Composite
Vinyl chloride	ug/L	once /year 2,3,4	8-hour Composite

(1) Samples for Volatile Organic Compounds must be collected as 4 discrete samples and composited per approved methods by the laboratory running the analyses.

TABLE 3.d: Effluent Characterization Testing - Selected Acid-extractable Compounds

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency	Sample Type
P-chloro-m-cresol	ug/L	once /year 2,3,4	8-hour Composite
2-chlorophenol	ug/L	once /year 2,3,4	8-hour Composite
2,4-dichlorophenol	ug/L	once /year 2,3,4	8-hour Composite

TABLE 3.d: Effluent Characterization Testing - Selected Acid-extractable Compounds

2,4-dimethylphenol	ug/L	once /year 2,3,4	8-hour Composite
4,6-dinitro-o-cresol	ug/L	once /year 2,3,4	8-hour Composite
2,4-dinitrophenol	ug/L	once /year 2,3,4	8-hour Composite
2-nitrophenol	ug/L	once /year 2,3,4	8-hour Composite
4-nitrophenol	ug/L	once /year 2,3,4	8-hour Composite
Pentachlorophenol	ug/L	once /year 2,3,4	8-hour Composite
Phenol	ug/L	once /year 2,3,4	8-hour Composite
2,4,6-trichlorophenol	ug/L	once /year 2,3,4	8-hour Composite

TABLE 3.e: Effluent Characterization Testing - Selected Base-neutral Compounds

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency	Sample Type
Acenaphthene	ug/L	Once year 2,3,4	8-hour Composite
Acenaphthylene	ug/L	Once /year 2,3,4	8-hour Composite
Anthracene	ug/L	Once /year 2,3,4	8-hour Composite
Benzidine	ug/L	Once /year 2,3,4	8-hour Composite
Benzo(a)anthracene	ug/L	Once /year 2,3,4	8-hour Composite
Benzo(a)pyrene	ug/L	Once /year 2,3,4	8-hour Composite
3,4 benzofluoranthene	ug/L	Once /year 2,3,4	8-hour Composite
Benzo(ghi)perylene	ug/L	Once /year 2,3,4	8-hour Composite
Benzo(k)fluoranthene	ug/L	Once /year 2,3,4	8-hour Composite
Bis (2-chloroethoxy) methane	ug/L	Once /year 2,3,4	8-hour Composite
Bis (2-chloroethyl) ether	ug/L	Once /year 2,3,4	8-hour Composite
Bis(2-chloroisopropyl) ether	ug/L	Once /year 2,3,4	8-hour Composite
Bis (2-ethylhexyl) phthalate	ug/L	Once /year 2,3,4	8-hour Composite
4-bromophenyl phenyl ether	ug/L	Once /year 2,3,4	8-hour Composite
Butyl benzyl phthalate	ug/L	Once /year 2,3,4	8-hour Composite
2-chloronaphthalene	ug/L	Once /year 2,3,4	8-hour Composite
4-chlorophenyl phenyl ether	ug/L	Once /year 2,3,4	8-hour Composite
Chrysene	ug/L	Once /year 2,3,4	8-hour Composite
Di-n-butyl phthalate	ug/L	Once /year 2,3,4	8-hour Composite
Di-n-octyl phthalate	ug/L	Once /year 2,3,4	8-hour Composite
Dibenzo(a,h)anthracene	ug/L	Once /year 2,3,4	8-hour Composite
1,2-dichlorobenzene	ug/L	Once /year 2,3,4	8-hour Composite
1,3-dichlorobenzene	ug/L	Once /year 2,3,4	8-hour Composite
1,4-dichlorobenzene	ug/L	Once /year 2,3,4	8-hour Composite
3,3-dichlorobenzidine	ug/L	Once /year 2,3,4	8-hour Composite
Diethyl phthalate	ug/L	Once /year 2,3,4	8-hour Composite

Dimethyl phthalate	ug/L	Once /year 2,3,4	8-hour Composite
2,4-dinitrotoluene	ug/L	Once /year 2,3,4	8-hour Composite
2,6-dinitrotoluene	ug/L	Once /year 2,3,4	8-hour Composite
1,2-diphenylhydrazine	ug/L	Once /year 2,3,4	8-hour Composite
Fluoranthene	ug/L	Once /year 2,3,4	8-hour Composite
Fluorene	ug/L	Once /year 2,3,4	8-hour Composite
Hexachlorobenzene	ug/L	Once /year 2,3,4	8-hour Composite
Hexachlorobutadiene	ug/L	Once /year 2,3,4	8-hour Composite
Hexachlorocyclopentadiene	ug/L	Once /year 2,3,4	8-hour Composite
Hexachloroethane	ug/L	Once /year 2,3,4	8-hour Composite
Indeno(1,2,3-cd)pyrene	ug/L	Once /year 2,3,4	8-hour Composite
Isophorone	ug/L	Once /year 2,3,4	8-hour Composite
Naphthalene	ug/L	Once /year 2,3,4	8-hour Composite
Nitrobenzene	ug/L	Once /year 2,3,4	8-hour Composite
N-nitrosodi-n-propylamine	ug/L	Once /year 2,3,4	8-hour Composite
N-nitrosodimethylamine	ug/L	Once /year 2,3,4	8-hour Composite
N-nitrosodiphenylamine	ug/L	Once /year 2,3,4	8-hour Composite
Phenanthrene	ug/L	Once /year 2,3,4	8-hour Composite
Pyrene	ug/L	Once /year 2,3,4	8-hour Composite
1,2,4-trichlorobenzene	ug/L	Once /year 2,3,4	8-hour Composite

TABLE 3.f: Effluent Characteristic Testing Based on Designated Uses

Additional Parameters from the Arizona Surface Water Quality Standards, Appendix A: Tables 1 & 2

Parameter	Reporting Units	Monitoring Requirements	
		Monitoring Frequency	Sample Type
Aldrin	ug/L	once /year 2,3,4	8-hour Composite
Barium	ug/L	once /year 2,3,4	8-hour Composite
Boron	ug/L	once /year 2,3,4	8-hour Composite
Chlordane	ug/L	once /year 2,3,4	8-hour Composite
1,2-cis-Dichloroethylene	ug/L	once /year 2,3,4	8-hour Composite
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	once /year 2,3,4	8-hour Composite
1,2-Dibromoethane (EDB) Ethylene dibromide	ug/L	once/ year 2,3,4	8-hour Composite
4,4-DDD (p,p,- Dichlorodiphenyldicholoroethane)	ug/L	once /year 2,3,4	8-hour Composite
4,4-DDE (p,p- Dichlorodiphenyldichloroethylene)	ug/L	once /year 2,3,4	8-hour Composite
4,4-DDT ((p,p- Dichlorodiphenyltrichloroethane)	ug/L	once /year 2,3,4	8-hour Composite
Dieldrin	ug/L	once /year 2,3,4	8-hour Composite
Di (2-ethylhexyl) adipate	ug/L	once /year 2,3,4	8-hour Composite
Endosulfan sulfate	ug/L	once /year 2,3,4	8-hour Composite
Endosulfan (Total)	ug/L	once /year 2,3,4	8-hour Composite
Endrin	ug/L	once /year 2,3,4	8-hour Composite

Endrin aldehyde	ug/L	once /year 2,3,4	8-hour Composite
Fluoride	ug/L	once /year 2,3,4	8-hour Composite
Heptachlor	ug/L	once /year 2,3,4	8-hour Composite
Heptachlor epoxide	ug/L	once /year 2,3,4	8-hour Composite
Hexachlorocyclohexane alpha Alpha-BHC	ug/L	once/ year 2,3,4	8-hour Composite
Hexachlorocyclohexane beta	ug/L	once/ year 2,3,4	8-hour Composite
Hexachlorocyclohexane delta	ug/L	once /year 2,3,4	8-hour Composite
Hexachlorocyclohexane gamma (lindane)	ug/L	once /year 2,3,4	8-hour Composite
Manganese	ug/L	once /year 2,3,4	8-hour Composite
Polychlorinatedbiphenyls (PCBs)	ug/L	once /year 2,3,4	8-hour Composite
Styrene	ug/L	once /year 2,3,4	8-hour Composite
Sulfides	ug/L	once /year 2,3,4	8-hour Composite
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ug/L	once /year 2,3,4	8-hour Composite
Toxaphene	ug/L	once /year 2,3,4	8-hour Composite
Xylene	ug/L	once/ year 2,3,4	8-hour Composite

E. The permittee shall monitor discharges from Outfalls 001 and mixing zone monitoring locations given in Part IV of this permit for Whole Effluent Toxicity (WET) as specified in Table 4 which follows. If chronic toxicity is detected above an action level or limit specified as follows, the permittee must perform follow-up testing and, as applicable, follow the TIE/TRE processes in Part IV.E of the permit.

TABLE 4: WET Testing

Effluent Characteristic (1)	Action Levels		Monitoring Requirements			
	Daily Maximum (2) (3)	Monthly Median (3)	Monitoring Frequency		Sample Type	
			Outfall		001	002
			001	002 (mixing zone)		
Chronic Toxicity *Selenastrum capricornutum* (Green algae)	1.6 TUc (4)	1.0 TUc (4)	First year of the permit	Annually (6)	Discrete	Depth composite (5)
	Limits					
Chronic Toxicity *Pimephales promelas* (Fathead minnow)	1.6 TUc (4)	1.0 TUc (4)	First year of the permit	Annually (6)	Discrete	Depth composite (5)
Chronic Toxicity *Ceriodaphnia dubia* (Water flea)	1.6 TUc (4)	1.0 TUc (4)	First year of the permit	Annually (6)	Discrete	Depth composite (5)
Acute Toxicity *Pimephales promelas* (Fathead minnow)	Fail (4)	Fail (4)	First year of the permit	Annually (6)	Discrete	Depth composite (5)
Acute Toxicity *Ceriodaphnia dubia* (Water flea)	Fail (4)	Fail (4)	First year of the permit	Annually (6)	Discrete	Depth composite (5)

Footnotes:

(1) See Part IV for additional information on requirements for testing and reporting Whole Effluent Toxicity (WET).
(2) Since completion of one Chronic WET test takes more than 24 hours, the daily maximum of WET is considered to be the highest allowable test result.
(3) Any exceedance of these values will require follow-up testing by the permittee. See Part IV.E of the permit for details
(4) A mixing zone is established for this action level for discharges from 002. See Part IV for mixing zone requirements. The action level for Outfall 001 applies at the discharge point.
(5) See Part IV.C for monitoring locations and depths.
(6) Samples shall be taken one month after discharge begins or at the termination of discharge if the discharge is for less than one month.

F. The discharge shall be free from pollutants in amounts or combinations that:

1 Settle to form bottom deposits that inhibit or prohibit the habitation, growth or propagation of aquatic life;

2. Cause objectionable odor in the area in which the surface water is located;

4. Cause off-flavor in aquatic organisms;

5. Are toxic to humans, animals, plants or other organisms;

6. Cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth or propagation of other aquatic life or that impair recreational uses;

7. Change the color of the surface water from natural background levels of color.

G. The discharge shall be free from oil, grease and other pollutants that float as debris, foam, or scum; or that cause a film or iridescent appearance on the surface of the water; or that cause a deposit on a shoreline, bank or aquatic vegetation.

H. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations:

Samples for Outfall 001 shall be taken at a point between the wellhead and the receiving water.

2. Samples for Outfall 002 shall be taken from the reuse distribution line at Lakeside Lake prior to discharge to the receiving water.

3 Sampling locations for In-Lake limitations given in this permit shall be as described in Part IV.C of this permit.

I. The discharge shall not cause the pH of the receiving water to change more than 0.5 standard units

J. The discharge shall not cause an increase in the ambient water temperature of more than 3.0 degrees Celsius.

K. The discharge shall not cause the dissolved oxygen concentration in the receiving water to fall below 6mg/l for A&Ww, unless the percent saturation of oxygen remains equal to or greater than 90%.

L. The discharge shall not cause the receiving water to exceed 80 mg/L for suspended sediment concentration.

PART II. MONITORING AND REPORTING

A. Sample Collection and Analysis

Quality Assurance (QA) Manual
The permittee shall keep a QA Manual at the facility that describes the sample collection and analyses processes. If the facility collects samples or conducts sample analyses in-house, the permittee shall develop the QA Manual. If a third party collects and/or analyzes samples on behalf of the permittee, the permittee shall obtain a copy. The QA Manual shall be available for review by ADEQ/ADHS upon request. The permittee is responsible for the quality and accuracy of all data required under this permit. The QA Manual shall be updated as necessary, and shall describe the following:

a. Project Management, including roles and responsibilities of the participants; purpose of sample collection; matrix to be sampled; the analytes or compounds being measured; applicable regulatory or permit-specific limits or Assessment Levels; and personnel qualification requirements for collecting samples.

b. Sample collection procedures; equipment used; the type and number of samples to be collected including QA/QC samples (i.e., background samples, duplicates, and equipment or field blanks); preservatives and holding times for the samples (see methods under 40 CFR 136 or 9 A.A.C. 14, Article 6 or any condition within this permit that specifies a particular test method.)

c. Approved analytical method(s) to be used; Method Detection Limits (MDLs) and Minimum Levels (MLs) to be reported; required QC results to be reported (e.g., matrix spike recoveries, duplicate relative percent differences, blank contamination, laboratory control sample recoveries, surrogate spike recoveries, etc.) and acceptance criteria; and corrective actions to be taken by the permittee or the laboratory as a result of problems identified during QC checks.

d. How the permittee will: perform data review; report results to ADEQ; resolve data quality issues; and identify limitations on the use of the data.

2. Sample collection, preservation and handling shall be performed as described in 40 CFR 136 including the referenced Editions of *Standard Methods for the Examination of Water and Wastewater*. Where collection, preservation and handling procedures are not described in 40 CFR 136, the procedures specified under 9 A.A.C. 14, Article 6 methods for wastewater samples shall be used. (The permittee shall outline the proper procedures in the QA Manual, and samples taken to meet the monitoring requirements in this permit must conform with these procedures whether collection and handling is performed directly by the permittee or contracted to a third-party.)

3. All samples collected for monitoring must be analyzed:
   a. by a laboratory that is licensed by the ADHS Office of Laboratory Licensure and Certification, and that has demonstrated proficiency within the last 12 months for each parameter to be sampled under the terms of this permit, under R9-14-609. This requirement does not apply to parameters that must be analyzed for at the time of

sampling and which are therefore exempt under A.A.C. R 9-14-602. These parameters include flow, dissolved oxygen, pH, temperature, and total residual chlorine.

b. using a method specified in this permit. If no test procedure is specified within this permit, then the permittee shall analyze the pollutant using:
   i. a test procedure listed in 40 CFR 136;
   ii. an alternative test procedure approved by the EPA as provided in 40 CFR 136;
   iii. a test procedure listed in 40 CFR 136, with modifications allowed by the EPA and approved as a method alteration by the ADHS under A.A.C. R9-14-610(B); or
   iv. If a test procedure for a pollutant is not available under subparagraphs (3)(b)(i) through (3)(b)(iii), a test procedure listed in A.A.C. R9-14-612 or approved under A.A.C. R9-14-610(B) for wastewater may be used, except the use of Hach Methods is not allowed unless otherwise specified in this permit. If there is no approved wastewater method for a parameter, any other method identified in 9 A.A.C. 14, Article 6 that will achieve appropriate detection limits may be used to analyze that parameter.

c. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods.

4. Because of the short holding time for chlorine, samples may be analyzed on-site using Hach Method No. 10014. Other Hach Methods are also acceptable for chlorine if the method has an MDL lower than effluent limitations specified in this permit.

5. The permittee shall use an analytical method with a Method Detection Limit (MDL, as defined in Appendix A of this permit) that is lower than the effluent limitations, Assessment Levels, Action Levels, or water quality criteria specified in this permit. **If all method-specific MDLs are higher than the limits specified in this permit, the permittee shall use the approved analytical method with the lowest method-specific MDL.**

6. The permittee shall use a standard calibration where the lowest standard point is equal to or less than the Minimum Level (ML) as defined under 40 CFR 136. When a method-specific ML is not available 40 CFR 136, the *interim* ML (see Appendix A- definitions) is to be used for calibration.

   When neither a ML nor MDL is promulgated under 40 CFR 136, the Laboratory ML, (as defined in Appendix A) shall be used for calibration.

7. In accordance with 40 CFR 122.45(c), effluent analyses for all metals, with the exception of chromium VI, shall be measured as "total recoverable metals". Effluent levels in this permit are for total recoverable metals, except for Chromium VI, for which the levels listed are dissolved.

B. Reporting of Monitoring Results

The permittee shall report monitoring results on Discharge Monitoring Report (DMR) forms supplied by ADEQ, to the extent that the results reported may be entered on the forms. The permittee shall submit results of all monitoring required by this permit in a format that will allow direct comparison with the limitations and requirements of this permit. If no discharge occurs during the reporting period, the permittee shall specify "No discharge" on the DMR. The results of effluent characterization monitoring required by Tables 3.a through 3.f taken at

a representative sample point do not have to be submitted on DMRs if the samples are collected when the facility is not discharging. These sample results must be submitted as an attachment to the DMRs that indicate "No discharge".

The permittee shall submit (see Appendix A- definitions) DMRs by the 28th day of the month following the end of any given monitoring period. For example, if the monitoring period ends January 31st, the permittee shall submit the DMR by February 28th. The permittee shall submit original copies of these and all other reports required in this Part, signed by an authorized representative, to ADEQ at the following address:

ADEQ Water Quality Compliance Section
Data Unit Mailcode: 5415B-1
1110 W. Washington
Phoenix, AZ 85007

For each month, a copy of the **AZPDES Discharge Flow Record** (found in Appendix E) is to be completed and submitted with the DMR for that month, along with copies of the original lab results for all parameters monitored during the reporting period.

2. Whenever sampling is done for ammonia, sampling must be done for temperature and pH concurrently. Results for these three parameters shall be recorded on the **Ammonia Data Log** provided in Appendix C, as well as on DMRs. The ammonia data log shall be submitted to ADEQ monthly to the address in Part II.B.1, above.

3 The permittee shall submit the results of the annual proficiency evaluation(s) performed under R9-14-609 to ADEQ and ADHS for all laboratories used in monitoring compliance with this permit.

4. For the purposes of reporting, the permittee shall use the reporting threshold equivalent to the method-specific ML. If there is no method-specific ML promulgated, the laboratory's ML shall be used.

5 For parameters with Daily Maximum Limits or Daily Maximum Assessment Levels specified in this permit, the permittee shall review the results of all samples collected during the reporting period and report:

For Daily Maximum Limits/Assessment Levels	The Permittee shall Report on the DMR
When the maximum value of any analytical result is greater than the ML (e.g., method-specific ML if one exists, or if not, the laboratory's ML)	The maximum value of all analytical results
When the maximum value detected is greater than or equal to the laboratory's MDL, but less than the ML;	*NODI (Q)* [1]
When the maximum value is less than the laboratory's MDL.	*NODI (B)* [2]

(1) NODI(Q) means Not Quantifiable
(2) NODI(B) means Below Detection

6 For parameters with Monthly Average Limits or Monthly Average Assessment Levels specified in this permit, the permittee shall review the results of all samples collected during the reporting period and report:

For Monthly Average Limits/Assessment Levels		The Permittee shall Report on the DMR
If only one sample is collected during the reporting period (monthly, quarterly, annually, etc.) (In this case, the sample result is the monthly average.)	When the value detected is greater than the ML (e.g., method-specific ML if one exists, or if not, the laboratory's ML)	the analytical result
	When the value detected is greater than or equal to the laboratory's MDL, but less than the ML:	*NODI (Q)*[1]
	When the value is less than the laboratory's MDL.	*NODI (B)*[2]
If more than one sample is collected during the reporting period	**All samples collected in the same calendar month must be averaged.** • When all results are greater than the ML, all values are averaged • When calculating monthly averages where some samples have non-numeric results, substitute the laboratory's MDL for NODI(Q) and substitute "0" for NODI(B).	the highest monthly average which occurred during the reporting period

(1) NODI(Q) means Not Quantifiable
(2) NODI(B) means Below Detection

6. If the information below is not provided on the laboratory reports required in Part II.B.1, the permittee shall attach a report to each DMR that includes the following for all analytical results during the reporting period:

   a. The analytical result

   b. The number or title of the approved analytical method, preparation and analytical procedure utilized by the laboratory, and method-specific MDL or method-specific ML of the analytical method for the pollutant. When no method-specific ML exists, the laboratory derived ML shall be reported.

   c The levels at which any results are reported as either *NODI(B)* or *NODI(Q)*

   d. Any applicable data qualifiers using Arizona Data Qualifiers Revision 2 (11/26/2003).

C. Twenty-four Hour Reporting of Noncompliance

The permittee shall orally report any noncompliance which may endanger the environment or human health within 24 hours from the time the permittee becomes aware of the event to:

ADEQ 24 hour hotline at 602-771-2330

The permittee shall also notify the Southern Regional Office at (528) 628-6724 by phone call or voice mail by 9 a.m. on the first business day following the noncompliance. The permittee shall also notify the Water Quality Compliance Section in writing within 5 days of the noncompliance event. The permittee shall include in the written notification a description of the noncompliance and its cause; the period of noncompliance, including dates and times, and, if the noncompliance has not been corrected, the time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

D. Monitoring Records

The permittee shall retain the following monitoring information

1 Date, exact location and time of sampling or measurements performed, preservatives used;

2. Individual(s) who performed the sampling or measurements;

3 Date(s) the analyses were performed;

4. Laboratory(s) which performed the analyses;

5 Analytical techniques or methods used;

6. Chain of custody forms;

7. Any comments, case narrative or summary of results produced by the laboratory. These comments should identify and discuss QA/QC analyses performed concurrently during sample analyses and should specify whether analyses met project requirements and 40 CFR 136. The summary of results must include information on initial and continuing calibration, surrogate analyses, blanks, duplicates, laboratory control samples, matrix spike and matrix spike duplicate results, sample receipt condition, holding times and preservation.

8 Summary of data interpretation and any corrective action taken by the permittee

9. Effluent Limitations or Assessment Levels for analytes/compound being analyzed

PART III. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

A. General Conditions

The permittee shall conduct chronic toxicity tests on discrete samples of the discharge from Outfall 001 once during the permit term.

2. The permittee shall conduct annual chronic toxicity tests on depth composited Lake samples within the mixing zone (See Part IV.A and C.)

3. The required WET tests must be performed on unmodified samples of the discharge to Outfall 001 and the Lake samples. **WET tests conducted on samples that are dechlorinated after collection are not acceptable for compliance with this permit.**

4. Chemical testing for ammonia (NH_3-N) and all the parameters listed in Part I.A, Tables 1 and 2 of this permit shall be performed on a split of at least one of the three composite and/or discrete samples taken for each chronic WET test performed. Analysis of the split sample(s) may be used to fulfill the monitoring requirements in Part I.A., but only for parameters whose required sample type is the same as the WET test sample..

5. Definitions related to toxicity are found in Appendix A

B. Acute Toxicity

The permittee shall conduct 96-hour acute toxicity tests with renewal at 48 hours on two species; *Ceriodaphnia dubia* and *Pimephales promelas* using 100% effluent and a control. The acute test may be completed as a non-renewal 48-hour acute test when a second sample for renewal at 48 hours cannot be taken due to a cessation of the discharge after an acute test has been initiated.

2. The permittee must follow the USEPA 5th edition manual, "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms" (EPA/821-R-02-012) for all acute compliance toxicity. The presence of chronic toxicity shall be estimated as specified in the method for each species tested.

3. The acute toxicity action level is any "failing" test result. The test "fails"if survival in 100% effluent is less than 90%, and is significantly different from control survival (which must be 90% or greater), as determined by hypothesis testing. Section 11.3 of the acute manual referenced above must be followed to determine Pass or Fail. Any result of "Fail" requires follow-up testing per Part IV, Section E.

4. The permittee shall report results as Pass or Fail.

C. Chronic Toxicity

1 The permittee shall conduct short-term chronic toxicity tests on three species: the waterflea, *Ceriodaphnia dubia* (survival and reproduction test); the fathead minnow, *Pimephales promelas* (larval survival and growth test); and the green alga, *Selenastrum capricornutum* (growth test). [The completion of the chronic WET test for *Ceriodaphnia dubia* and *Pimephales promelas* requires a minimum of three samples be taken for renewals.]

2. The permittee must follow the USEPA 4th edition manual, "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" (EPA/821-R-02-013) for all chronic compliance toxicity testing.

3 The chronic toxicity limit or action levels are any one test result greater than 1.6 TUc or any calculated monthly median value greater than 1.0 TUc. If chronic toxicity is detected above these values, follow-up testing is required per Part IV, Section E. A chronic toxicity unit (TUc) shall be calculated as TUc = 100/NOEC.

4. The chronic WET test shall be conducted using a series of five dilutions and a control. The following dilution series must be used: 12.5, 25, 50, 75, 100% effluent.

D. Quality Assurance

Effluent samples must be maintained between 0 and 6°C from collection until utilized in the toxicity testing procedure. When a composite sample is required, each aliquot making up the composite must be chilled after collection and throughout the compositing period. The single allowable exception is when a grab sample is delivered to the performing laboratory for test initiation no later than 4 hours following the time of collection.

2. Control and dilution water should be receiving water or lab water as appropriate, as described in the 40 CFR Part 136.3 approved method. If the dilution water used is different from the culture water, a second control, using culture water shall also be used.

3. Reference toxicity tests, (a check of the laboratory and test organisms' performance), shall be conducted at least 1 time in a calendar month for each toxicity test method conducted in the laboratory during that month. Additionally, any time the laboratory changes its source of test organisms, a reference toxicity test must be conducted before or in conjunction with the first WET test performed using the organisms from the newer source. Reference toxicant testing must be conducted using the same test conditions as the effluent toxicity tests (ie., same test duration, etc.).

4. If either the reference toxicant test or the effluent test does not meet all test acceptability criteria as specified in the 40 CFR Part 136.3 approved WET methods, then the permittee must re-sample and re-test within 14 days of receipt of the test results. The re-sampling and re-testing requirements include laboratory induced error in performing the test method.

5. The chronic reference toxicant and effluent tests must meet the upper and lower bounds on test sensitivity as determined by calculating the percent minimum significant difference (PMSD) for each test result. The test sensitivity bound is specified for each test method (see Section 10, Table 6 in EPA/821-R-02-013). There are five possible outcomes based on the PMSD result.

   a. *Unqualified Pass*- The test's PMSD is within bounds and there is no significant difference between the means for the control and the effluent. The regulatory authority would conclude that there is no toxicity.

   b. *Unqualified Fail*- The test's PMSD is larger than the lower bound (but not greater than the upper bound) in Table 6 and there is a significant difference between the means for the control and the effluent. The regulatory authority would conclude that there is toxicity.

   c. *Lacks Test Sensitivity*- The test's PMSD exceeds the upper bound in Table 6 and there is no significant difference between the means for the control and the effluent. The test is considered invalid. An effluent sample must be collected and another toxicity test must be conducted within 14 days of receipt of the test results.

   d. *Lacks Test Sensitivity*- The test's PMSD exceeds the upper bound in Table 6 and there is a significant difference between the means for the control and the effluent. The test is considered valid. The regulatory authority will conclude that there is toxicity.

   e. *Very Small but Significant Difference*- The relative difference between the means for the control and effluent is smaller than the lower bound in Table 6 and this difference is statistically significant. The test is acceptable and the NOEC should be determined.

E. Toxicity Identification Evaluation (TIE)/Toxicity Reduction Evaluation (TRE) Processes

1. If acute or chronic toxicity is detected above a limit or an action level specified in Part I.E. Table 4 and Part III, Section B.3 or C.3 and the source of toxicity is known (for instance, a

temporary plant upset), then the permittee shall conduct one follow-up test within two weeks of receipt of the sample results that exceeded the action level. The permittee shall use the same test and species as the failed toxicity test. If toxicity is detected in the follow-up, the permittee shall immediately begin developing a TRE plan and submit the plan to ADEQ for review and approval within 30 days after receipt of the toxic result. Requirements for the development of a TRE are listed in paragraph 3 below. The permittee must implement the TRE plan as approved and directed by ADEQ.

If acute or chronic toxicity is detected above a limit or an action level specified in Part I.E. Table 4 and Part IV, Sections B.3 or C.3 and the source of toxicity is unknown, the permittee shall begin additional toxicity monitoring within two weeks of receipt of the sample results that exceeded the action level. The permittee shall conduct one WET test approximately every other week until either a test exceeds an action level or four tests have been completed. The follow-up tests must use the same test and species as the failed toxicity test. For intermittent discharges, testing shall be conducted on the next four discharge events using the same test and species as the failed toxicity test.

a. If none of the four tests exceed a WET action level, then the permittee may return to the routine WET testing frequency specified in this permit.

b. If a WET action level is exceeded in any of the additional tests, the permittee shall immediately begin developing a TRE plan and submit the plan to ADEQ for review and approval within 30 days after receipt of the toxic result. Requirements for the development of a TRE are listed in subsection 3, below. The permittee must implement the TRE plan as approved and directed by ADEQ.

3. The permittee shall use the EPA guidance manual *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*, 1999 [EPA/833/B-99/002] in preparing a TRE plan. The TRE plan shall include, at a minimum, the following:

a. Further actions to investigate and identify the causes of toxicity, if unknown. The permittee may initiate a TIE as part of the TRE process using the following EPA manuals as guidance: *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I,* 1992 [EPA/600/6-91/005F]; *Methods for Aquatic Toxicity Identification Evaluations: Phase I, Toxicity Characterization Procedures*, 2nd Edition, 1991 [EPA/600/6-91/003]; *Methods for Aquatic Toxicity Identification Evaluations: Phase II, Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity,* 1993 [EPA/600/R-92/080]; and *Methods for Aquatic Toxicity Identification Evaluations: Phase III, Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity,* 1993 [EPA/600/R-92/081].

b. Action the permittee will take to mitigate the impact of the discharge and to prevent the recurrence of toxicity; and

c. A schedule for implementing these actions.

F. WET Reporting

The permittee shall report chronic toxicity results on DMRs in Chronic Toxicity Units (TUc). The TUc for DMR reporting shall be calculated as TUc = 100/NOEC.

2. In addition to reporting WET results on DMRs, the permittee shall submit a copy of the full lab report(s) for all WET testing conducted during the monitoring period covered by the DMR. The lab report should report TUc as 100/NOEC **and** as $100/IC_{25}$. If the lab report does not contain any of the following items, then these must also be supplied in a separate attachment to the report: 1) sample collection and test initiation dates, 2) the results of the effluent analyses for all parameters required to be tested concurrently with WET testing as defined in Part I, Tables 1, 1a, 1b, 2a and 2b of this permit, and 3) copies of completed "AZPDES Discharge Flow Record"s for the months in the WET monitoring period.

3. WET lab reports and any required additional attachments shall be submitted to ADEQ by the 28th day of the month following the end of the WET monitoring period, or upon request, to the following address:

Arizona Department of Environmental Quality
ADEQ Surface Water Permits Unit, Mailcode: 5415A-1
1110 W. Washington
Phoenix, AZ 85007

(NOTE: This is not the same ADEQ address as the one specified under Part II.B.1 of this permit.)

PART IV. SPECIAL CONDITIONS

A. MIXING ZONE CONDITIONS

1 A mixing zone is granted for the limits on ammonia, chlorine, ortho-phosphorus, and whole effluent toxicity for discharges from Outfall 002. Mixing zone monitoring location are given in Part IV.C in Part IV.C.

2. Compliance with the chronic ammonia criteria must be achieved at all depths at monitoring points Cc, Cnw and Cse given in the table below. Compliance with the acute ammonia criteria must be achieved at all depths at monitoring points Ac, Anw and Ase given in the table in Part IV.C.

3. Compliance with the daily maximum chlorine limit from Table 1.a shall be achieved at all depths for monitoring points Ac, Anw, and Ase given in the table below. Compliance with the monthly average chlorine limit must be achieved at all depths at monitoring points Cc, Cnw and Cse given in the table in Part IV.C.

4. Compliance with the chronic WET action levels from Table 4 shall be measured at monitoring point Cc given in the table in Part IV.C. Compliance with the acute WET action levels from Table 4 shall be at monitoring point Ac, given in the Table in Part IV.C. (Samples shall be composites of the specific depths at each site.)

5. Compliance with the ortho-phosphorus limit from Table 1.a must be achieved at all depths at monitoring points Cc, Cnw and Cse given in the table in Part IV.C.

B. LAKE MANAGEMENT PLAN

1. The permittee shall develop a Lake Management Plan to determine effective management activities for the Lake. The plan shall include:

   a. Monitoring schedules for the Lake. At a minimum the plan shall specify monitoring for DO, pH, temperature, ortho-phosphorous, total phosphorous, and ammonia.

   b. Provisions for use of alum to control phosphorous levels in the Lake if needed.

2. The plan shall be submitted to ADEQ for approval by October 1, 2006.

3. The results of monitoring required by the Lake Management Plan shall be submitted annually by October 30th to:

Arizona Department of Water Quality
ADEQ Surface Water Permits Unit, Mailcode: 5415A-1
1110 W. Washington St.
Phoenix, AZ 85007

C. LAKE MONITORING REQUIREMENTS.

1 The Lake shall be monitored, as required in Part I of this permit, at the locations specified below (See also Appendix F for map of sampling locations).

Parameter	Chronic mixing zone monitoring locations			Acute mixing zone monitoring locations			Non-mixing zone monitoring locations	
	Cc (2)	Cnw (3)	Cse (4)	Ac (5)	Anw (6)	Ase (7)	I (8)	H(9)/ BKG(11)
Ammonia (1)	Chronic limit applies	Chronic limit applies	Chronic limit applies	Acute limit applies	Acute limit applies	Acute limit applies	NA	Report
Chlorine	4 ug/L	4 ug/L	4 ug/L	8 ug/L		8 ug/L	NA	Report
Chlorophyll-a	Composite of surface samples at each of the 3 sites			---	---	---	NA	Report
Dissolved Oxygen (within 1 m of the surface)	Surface sample only	Surface sample only	Surface sample only	Surface sample only	Surface sample only	Surface sample only	Surface sample only	Surface sample only
Dissolved Oxygen (depth)	Report	Report	Report	Report	Report	Report	One meter from the bottom	One meter from the bottom
Nitrate/Nitrite	Report	Report	Report	Report	Report	Report	Report	Report
Ortho-phosphorous	0.009 mg/L	0.009 mg/L	0.009 mg/L	Report	Report	Report	Report	Report
Total Phosphorous	Report	Report	Report	Report	Report	Report	Report	Report
pH	(1)	(1)	(1)	(1)	(1)	(1)	NA	Report
Temperature	(1)	(1)		(1)	(1)	(1)	NA	Report
Acute WET (2 species as indicated in Table 4)	---	---		Report	---	---	NA	Report
Chronic WET (3 species as indicated in Table 4)	Report	---	---	---	---	---	NA	Report

(1) The ammonia standard is dependant on pH and temperature. pH and temperature must be measured at the same time as ammonia and recorded on the ammonia data log in Appendix C.
(2) Cc= center chronic mixing zone compliance point located at the center of an arc drawn from the discharge point with a 250 foot radius. Samples will be taken at the surface, 2, and 4 meters depth and the bottom of the lake.
(3) Cnw= northwest chronic mixing zone compliance point located 100 feet from the north shore along a 250 foot arc drawn from the discharge point. Samples will be taken at the surface, at 1.5 meters depth and at the bottom of the lake.
(4) Cse= southeast chronic mixing zone compliance point located 100 feet from the east shore along an arc drawn from the discharge point with a 250 foot radius. Samples will be taken at the surface, at 1.5 meters depth and the bottom of the lake.
(5) Ac = center acute mixing zone compliance point located at the center of an arc drawn from the discharge point with a 125 foot radius. Samples will be taken at the surface, 1.5 meters depth and the bottom of the lake.
(6) Anw = northwest acute mixing zone compliance point located 50 feet from the north shore along an arc drawn from the discharge point with a 125 foot radius. Samples will be taken at the surface and the bottom of the lake.
(7) Ase = southeast acute mixing zone compliance point located 50 feet from the east shore along an arc drawn from the discharge point with a 125 foot radius. Samples will be taken at the surface and the bottom of the lake.
(8) I = as identified in the *Lakeside Lake TMDL Nutrients and Associated Parameters, Arizona Department of Environmental Quality, 2005.*
(9) H = as identified in the *Lakeside Lake TMDL Nutrients and Associated Parameters, Arizona Department of Environmental Quality, 2005.*
(10) Composite of discrete samples from surface at sites Cc, Cse and Cnw.
(11) Site H is also the background monitoring location

2. All Lake monitoring shall be conducted in accordance with the requirements of A.A.C. R18-11 602.

D. REOPENER

This permit may be modified per the provisions of A.A.C. R18-9-B906, and R18-9-A905 which incorporates 40 CFR Part 122. This permit may be reopened based on newly available information; to add conditions or limits to address demonstrated effluent toxicity; to implement any EPA-approved new Arizona water quality standard; or to re-evaluate reasonable potential (RP), if Assessment Levels in this permit are exceeded.

APPENDIX A PART A: ACRONYMs

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
AZPDES	Arizona Pollutant Discharge Elimination System
A.R.S.	Arizona Revised Statutes
CFR	Code of Federal Regulations
CFU	colony forming units
Director	The Director of ADEQ or any authorized representative thereof
DMR	Discharge Monitoring Report
EPA	The U.S. Environmental Protection Agency
kg/day	kilograms per day
MGD	million gallons per day
mg/L	milligrams per Liter, also equal to parts per million (ppm)
MPN	Most Probable Number
NPDES	National Pollutant Discharge Elimination System
QA	quality assurance
ug/L	micrograms per Liter, also equal to parts per billion (ppb)

APPENDIX A PART B: DEFINITIONS

ACUTE TOXICITY TEST is a test used to determine the concentration of effluent or ambient waters that produces an adverse effect (lethality) on a group of test organisms during a short-term exposure (e.g., 24, 48, or 96 hours). Acute toxicity is measured using statistical procedures (e.g., point estimate techniques or hypothesis testing) and is reported as PASS/FAIL or in TUas, where TUa = $100/LC_{50}$.

ACUTE-to-CHRONIC RATIO (ACR) is the ratio of the acute toxicity of an effluent or a toxicant to its chronic toxicity. It is used as a factor for estimating chronic toxicity on the basis of acute toxicity data, or for estimating acute toxicity on the basis of chronic toxicity data.

CHRONIC TOXICITY TEST is a test in which sublethal effects (e.g., reduced growth or reproduction) are measured in addition to lethality. Chronic toxicity is measured as TUc = 100/NOEC or TUc = 100/Ecp or 100/ICp. The ICp and ECp value should be the approximate equivalent of the NOEC calculated by hypothesis testing for each test method.

COMPOSITE SAMPLE means a mixture of two or more discrete samples (aliquots) obtained at equal time intervals (e.g., 24-hour composite may be three samples collected eight hours apart, four samples six hours apart, or eight samples collected three hours apart) or collected proportional to the flow rate over the compositing period. This permit may further specify the number of samples to be composited, the timing of the samples, and the volume of each aliquot to be collected.

DAILY MAXIMUM CONCENTRATION LIMIT means the maximum allowable discharge of a pollutant in a calendar day as measured on any single discrete sample or composite sample.

DAILY MAXIMUM MASS LIMIT means the maximum allowable total mass of a pollutant discharged in a calendar day.

DISCRETE or GRAB SAMPLE means an individual **sample of at least 100 mL** collected from a single location, or over a period of time not exceeding 15 minutes

EFFECT CONCENTRATION POINT (ECP) is a point estimate of the toxicant (or effluent) concentration that would cause an observable adverse effect (e.g., survival or fertilization) in a given percent of the test organisms, calculated from a continuous model (e.g., USEPA Probit Model).

HARDNESS means the sum of the calcium and magnesium concentrations, expressed as calcium carbonate ($CACO_3$) in milligrams per liter.

HYPOTHESIS TESTING is a statistical technique (e.g., Dunnetts test) that determines what concentration is statistically different from the control. Endpoints determined from hypothesis testing are NOEC and LOEC. The two hypotheses commonly tested in WET are:

- Null hypothesis (H_0): The effluent is not toxic.
- Alternative hypothesis (H_a): The effluent is toxic.

INHIBITION CONCENTRATION (IC) is a point estimate of the toxicant concentration that would cause a given percent reduction in a non-lethal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., USEPA Interpolation Method). IC25 is a point estimate of the toxicant concentration that would cause a 25% reduction in a non-lethal biological measurement.

INTERIM ML If a promulgated method-specific ML is not available, then an interim ML must be calculated. The interim ML is equal to 3.18 times the promulgated method-specific MDL rounded to the nearest multiple of 1, 2, 5, 10, 20, 50, etc.

LABORATORY ML, is to be calculated when neither an ML or MDL are promulgated under 40 CFR 136 or 9 A.A.C. 14, Article 6. A laboratory ML should be calculated by multiplying the best estimate of detection by a factor or 3.18 and rounding the value to the nearest multiple of 1, 2, 5, 10, 20, 50, etc. When a range of detection is given, the lower end value of the range of detection should be used to calculate the ML.

LC50 is the toxicant (or effluent) concentration that would cause death in 50 percent of the test organisms

METHOD DETECTION LIMIT (MDL) is the minimum concentration of an analyte that can be detected with 99% confidence that the analyte concentration is greater than zero, as defined under 40 CFR 136 or 9 A.A.C. 14, Article 6 methods. The procedure for determination of a laboratory MDL is prescribed under 9 A.A.C. 14, Article 6 methods or by 40 CFR Part 136, Appendix B (1998).

METHOD SPECIFIC ML is the promulgated method-specific ML contained in 40 CFR 136 or 9 A.A.C.14, Article 6 (as "Minimum Levels") and must be used if available.

MINIMUM LEVEL (ML) is the concentration at which the entire analytical system gives a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all of the method-specified sample weights, volumes, and processing steps have been followed (as defined in EPA's draft *National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent Limitations Set Below Analytical Detection/Quantitative Levels,* March 22, 1994).

MIXING ZONE is an area where an effluent discharge undergoes initial dilution and may be extended to cover the secondary mixing in the ambient waterbody. A mixing zone is an allocated impact zone where water quality criteria can be exceeded as long as acutely toxic conditions are prevented.

MONTHLY OR WEEKLY AVERAGE CONCENTRATION LIMIT, other than for bacteriological testing, means the highest allowable average calculated as an arithmetic mean of consecutive measurements made during calendar month or week, respectively. The "monthly or weekly average concentration limit" for *E. coli* bacteria means the highest allowable average calculated as the geometric mean of a minimum of four (4) measurements made during a calendar month or week, respectively. The geometric mean is the nth root of the product of n numbers. For either method (CFU or MPN), when data is reported as "0" or non-detect then input a "1" into the calculation for the geometric mean.

MONTHLY OR WEEKLY AVERAGE MASS LIMITATION means the highest allowable value that shall be obtained by taking the total mass discharged during a calendar month or week, respectively, divided by the number of days in the period that the facility was discharging. Where less than daily sampling is required by this permit, the monthly or weekly average value shall be determined by the summation of all the measured discharges by mass divided by the number of days during the month or week, respectively, when the measurements were made.

NO OBSERVED EFFECT CONCENTRATION (NOEC) is the highest tested concentration of effluent or toxicant, that causes no observable adverse effect on the test organisms (i.e., the highest concentration of toxicant at which the values for the observed responses are not **statistically significant different from the controls).**

POINT ESTIMATE TECHNIQUES such as Probit, Interpolation Method, Spearman-Karber are used to determine the effluent concentration at which adverse effects (e.g., fertilization, growth or survival) occurred. For example, concentration at which a 25 percent reduction in fertilization occurred.

REFERENCE TOXICANT TEST is a toxicity test conducted with the addition of a known toxicant to indicate the sensitivity of the organisms being used and demonstrate a laboratory's ability to obtain consistent results with the test method. Reference toxicant data are part of the routine QA/QC program to evaluate the performance of laboratory personnel and test organisms.

SIGNIFICANT DIFFERENCE is defined as statistically significant difference (e.g., 95% confidence level) in the means of two distributions of sampling results.

SINGLE CONCENTRATION ACUTE TEST is a statistical analysis comparing only two sets of replicate observations. In the case of WET, comparing only two test concentrations (e.g., a control and 100% effluent). The purpose of this test is to determine if the 100% effluent concentration differs from the control (i.e., the test passes or fails).

SUBMIT, as used in this permit, means post-marked, documented by other mailing receipt, or hand-delivered to ADEQ.

TEST ACCEPTABILITY CRITERIA (TAC) are specific criteria for determining whether toxicity tests results are acceptable. The effluent and reference toxicant must meet specific criteria as defined in the test method.

TOXIC UNIT (TU) is a measure of toxicity in an effluent as determined by the acute toxicity units or chronic toxicity units measured. Higher the TUs indicate greater toxicity.

TOXIC UNIT ACUTE (TUa) is the reciprocal of the effluent concentration that causes 50 percent of the organisms to die by the end of an acute toxicity test (i.e., TUa = 100/LC50).

TOXIC UNIT CHRONIC (TUc) is the reciprocal of the effluent concentration that causes no observable effect on the test organisms by the end of a chronic toxicity test (i.e., TUc = 100/NOEC).

TOXICITY IDENTIFICATION EVALUATION (TIE) is a set of procedures used to identify the specific chemical(s) causing effluent toxicity.

TOXICITY REDUCTION EVALUATION (TRE) is a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

TOXICITY TEST is a procedure to determine the toxicity of a chemical or an effluent using living organisms. A toxicity test measures the degree of effect of a specific chemical or effluent on exposed test organisms.

WHOLE EFFLUENT TOXICITY is the total toxic effect of an effluent measured directly with a toxicity test.

APPENDIX C

Ammonia Data Log

Date of Sample	Sampling location	Depth of sample (meters)	Ammonia Value In Effluent (mg/L N)	pH (in effluent)	Temperature (in effluent) (Celsius)	Ammonia Standard as Determined from Table in Appendix D	
						Acute criteria	Chronic criteria

Please copy and complete for each month of each year for permit term. Attach any additional pages as necessary.

Signature of Authorized Representative _____

APPENDIX D

AMMONIA SPECIAL REPORTING REQUIREMENTS

The Arizona Administrative Code, Title 18, Chapter 11 Department of Environmental Quality Water Quality Standards contains acute and chronic ammonia standards that are contingent upon temperature and/or pH values. The acute and chronic tables for Aquatic and Wildlife warm will follow below. The permittee may refer to these tables to determine the ammonia standard that applies each time an ammonia sample is taken. The chronic criteria will be applied at Cc, Cse, and Cnw of the mixing zone. The acute criteria will be applied at point Ac, Anw, Ase of the mixing zone. The permittee must record all data results for ammonia, pH, temperature and sampling dates in a log (Appendix C). The required minimum sampling frequency for these parameters may be found in Table 1 of this permit. Anytime an ammonia sample is found to be above the corresponding ammonia standard for the pH and temperature at the time the sample was taken, the permittee must highlight this on the ammonia data log. The ammonia data log must be submitted to the following address monthly with Data Monitoring Reports: Arizona Department of Environmental Quality, Surface Water Permits Unit, 1110 W. Washington St., Phoenix, AZ 85007. Please note that this is a different address than that specified in Section B of this permit for DMR submittal. These results must also be reported on DMRs. However, since the DMR format doesn't provide all the necessary information, monthly submittal of the ammonia data log is required.

A&Wc and A&Ww** Designated **Uses

Determination of Chronic Total Ammonia Criteria in mg N / L

Based on pH and Temperature at Time of Sampling (1) (2)

pH	Temperature, °C									
	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.8	2.46
6.6	6.57	6.57	97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	4.52	3.98	3.5	3.07	2.7	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.3	3.78	3.32	2.92	2.57	2.25
7	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.5	3.08	2.7	2.38	2.09
7.2	5.39	5.39	4.9	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.6'	4.06	3.57	3.13	2.75	2.42	2.13	1.87
7.4	4.73	4.73	4.3	3.78	3.33	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.9	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.5	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.8	2.8	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8	2.43	2.43	2.21	1.94	1.71	1.5	1.32	1.16	1.02	0.897
8.1	2.1	2.1	1.91	1.68	1.47	1.29	1.14	1	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.7	0.615	0.541	0.475
8.5	1.09	1.09	0.99	0.87	0.765	0.672	0.591	0.52	0.457	0.401
8.6	0.92	0.92	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.48	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9	0.486	0.486	0.442	0.389	0.342	0.3	0.264	0.232	0.204	0.179

Footnotes:

(1) pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia
(2) If field measured pH and/or temperature values fall between the Chronic Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard

Determination of Chronic Total Ammonia Criteria in mg N / L

Based on pH and Temperature at Time of Sampling (1) (2)

6.5	48.8
6.6	46.6
6.7	44.5
6.8	42.0
6.9	39.3
7.0	36.1
7.1	32.8
7.2	29.6
7.3	26.4
7.4	23.9
7.5	21.9
7.6	20.0
7.7	18.4
7.8	16.1
7.9	13.1
8.0	10.3
8.1	8.40
8.2	6.90
8.3	5.72
8.4	4.71
8.5	3.85
8.6	3.12
8.7	2.65
8.8	2.26
8.9	1.94
9.0	1.67

(1) pH and temperature are field measurements taken at the same time and location as the water samples destined for the laboratory analysis of ammonia
(2) If field measured pH and/or temperature values fall between the Acute Total Ammonia tabular values, round field measured values according to standard scientific rounding procedures to nearest tabular value to determine the ammonia standard

APPENDIX E

AZPDES Discharge Flow Record

Groundwater discharges to
Lakeside Lake- AZ0024201

Outfall No.: 001

Month: **Year:**

DATE	Flow Duration [1] (Total hours per day)	Flow Rate[2] (Total MGD per day)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Comment:

footnotes:

(1) Total time of discharge in hours per day. If actual time is not available, use an estimate of flow duration.

(2) Report flow discharged in MGD. If no discharge occurs on any given day, report 'ND' for the flow for that day

Signature of Authorized Representative:

DMR attachment

AZPDES Discharge Flow Record

Reclaimed Water discharges to
Lakeside Lake- AZ0024201

Outfall No.: 002

Month: **Year:**

DATE	Flow Duration [1] (Total hours per day)	Flow Rate[2] (Total MGD per day)
1		
2		
3		
4		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Comment:

footnotes:

(1) Total time of discharge in hours per day. If actual time is not available, use an estimate of flow duration.

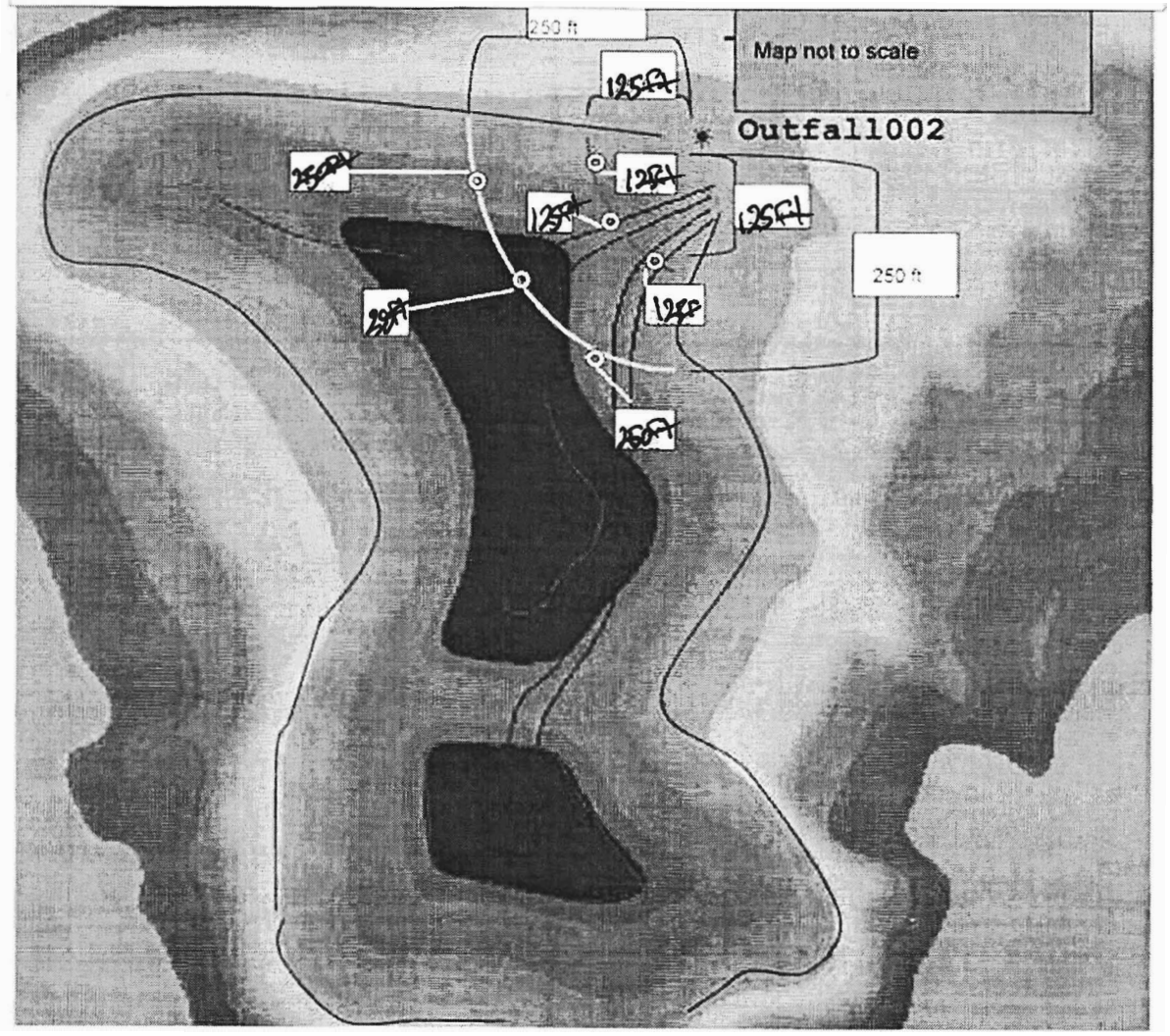
(2) Report flow discharged in MGD. If no discharge occurs on any given day, report 'ND' for the flow for that day

Signature of Authorized Representative: _____

DMR attachment

APPENDIX F

Mixing Zone Sampling Locations

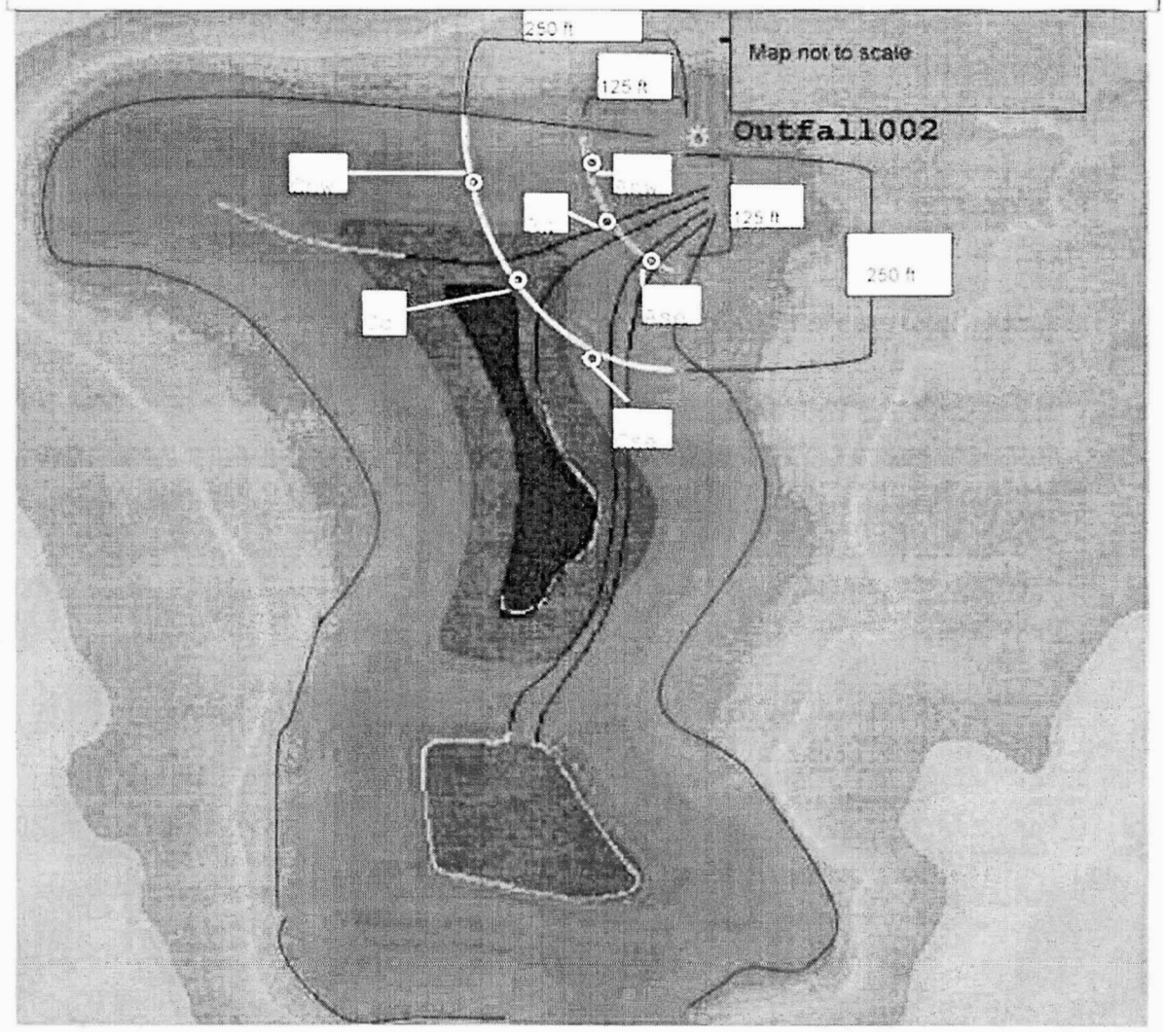


250ft liver = Chronic
125 = Acute
~~250~~

A^NW = inside
A^C = center
A^SE = SE

APPENDIX F

Mixing Zone Sampling Locations



APPENDIX G

STANDARD AZPDES PERMIT CONDITIONS & NOTIFICATIONS

(Updated as of February 2, 2004)

1 Duty to Reapply [R18-9-B904(C)]
Unless the Permittee permanently ceases the discharging activity covered by this permit, the Permittee shall submit a new application 180 days before the existing permit expires.

2. Applications [R18-9-A905(A)(1)(c) which incorporates 40 CFR 122.22]

a. All applications shall be signed as follows

1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

A) A president, secretary, treasurer, or vice-president of the corporation in charge of a principle business function, or any other person who performs similar policy- or decision-making functions for the corporation, or

B) The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

3) For a municipality, State, Federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes: (i) The chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

b. All reports required by permits and other information requested by the Director shall be signed by a person described in paragraph (a) of this Section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1) The authorization is made in writing by a person described in paragraph (a) of this section;

2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) and,

3) The written authorization is submitted to the Director.

c. Changes to Authorization. If an authorization under paragraph (b) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph (b) of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

d. Certification. Any person signing a document under paragraph (a) or (b) of this section shall make the following certification:

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

3 Duty to Comply [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(a)(i) and A.R.S. §§ 49- 262, 263.01, and 263.02.]

a. The Permittee shall comply with all conditions of this permit and any standard and prohibition required under A.R.S. Title 49, Chapter 2, Article 3.1 and A.A.C. Title 18, Chapter 9, Articles 9 and 10. Any permit noncompliance constitutes a violation of the Clean Water Act; A.R.S. Title 49, Chapter 2, Article 3.1; and A.A.C. Title 18, Chapter 9, Articles 9 and 10, and is grounds for enforcement action, permit termination, revocation and reissuance, or modification, or denial of a permit renewal application.

b. The issuance of this permit does not waive any federal, state, county, or local regulations or permit requirements with which a person discharging under this permit is required to comply.

c. The Permittee shall comply with the effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the Clean Water Act within the time provided in the regulation that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

d. Civil Penalties. A.R.S. § 49-262(C) provides that any person who violates any provision of A.R.S. Title 49, Chapter 2, Article 3.1 or a rule, permit, discharge limitation or order issued or adopted under A.R.S. Title 49, Chapter 2, Article 3.1 is subject to a civil penalty not to exceed $25,000 per day per violation.

e. Criminal Penalties. Any a person who violates a condition of this permit, or violates a provision under A.R.S. Title 49, Chapter 2, Article 3.1, or A.A.C. Title 18, Chapter 9, Articles 9 and 10 is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which may include the possibility of fines and/or imprisonment.

4 Need to Halt or Reduce Activity Not a Defense [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(c)]

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. Duty to Mitigate [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(d)]

The Permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

6 Proper Operation and Maintenance [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(e)]

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. 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 which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

7. Permit Actions [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(f)]

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

8. Property Rights [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(g)]

This permit does not convey any property rights of any sort, or any exclusive privilege.

9. Duty to Provide Information [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(h)]

The Permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee shall also furnish to the Director upon request, copies of records required to be kept by this permit.

10. Inspection and Entry [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(i)]

The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and such other documents as may be required by law, to:

a Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the terms of the permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring equipment or control equipment), practices or operations regulated or required under this permit; and

d Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by A.R.S. Title 49, Chapter 2, Article 3.1, and A.A.C. Title 18, Chapter 9, Articles 9 and 10, any substances or parameters at any location.

11 Monitoring and Records [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(j)]

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application, except for records of monitoring information required by this permit related to the Permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503). This period may be extended by request of the Director at any time.

c. Records of monitoring information shall include:

1) The date, exact place and time of sampling or measurements;

2) The individual(s) who performed the sampling or measurements;

3) The date(s) the analyses were performed;

4) The individual(s) who performed the analyses

5) The analytical techniques or methods used; and

6) The results of such analyses.

d Monitoring must be conducted according to test procedures specified in this permit. If a test procedure is not specified in the permit, then monitoring must be conducted according to test procedures approved under A.A.C. R18-9-A905(B) including those under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503 (for sludge).

e. The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained in this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both for first conviction. For a second conviction, such a person is subject to a fine of not more than $20,000 per day of violation, or imprisonment for not more than four years, or both.

Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained in this permit is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which includes the possibility of fines and/or imprisonment.

12. Signatory Requirement [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(k)]

a. All applications, reports, or information submitted to the Director shall be signed and certified (See 40 CFR 122.22 incorporated at R18-9-A905(A)(1)(c))

b. The CLEAN WATER ACT provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both for a first conviction. For a second conviction, such a person is subject to a fine of not more than $20,000 per day of violation, or imprisonment of not more than four years, or both.

13. Reporting Requirements [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(l)]

a. Planned changes. The Permittee shall give notice to the Director as soon as possible of any planned physical alterations of additions to the permitted facility. Notice is required only when:

1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b) (incorporated by reference at R18-9-A905(A)(1)(e)); or

2) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1) (incorporated by reference at R18-9-A905(A)(3)(b)).

3) The alteration or addition results in a significant change in the Permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. (R18-9-B905) This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to

change the name of the Permittee and incorporate such other requirements as may be necessary under Arizona Revised Statutes and the Clean Water Act.

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

2) If the Permittee monitors any pollutant more frequently than required by the permit, then the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR, or sludge reporting form specified by the Director.

3) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

f. Twenty-four hour reporting.

1) The Permittee shall report any noncompliance which may endanger human health or the environment. Any information shall be provided orally within 24 hours from the time the Permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

2) The following shall be included as information which must be reported within 24 hours under this paragraph.

a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR 122.41(g) which is incorporated by reference at R18-9-A905(A)(3)(a))

b) Any upset which exceeds any effluent limitation in the permit.

c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours. (See 40 CFR 122.44(g) which is incorporated by reference at R18-9-A905(A)(3)(d))

g. Other noncompliance. The Permittee shall report all instances of noncompliance not reported under paragraphs (d), (e), and (f) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (f) of this section.

h. Other information. Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

14. Bypass [R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(m)]

a. Definitions

1) "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations. The Permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of paragraphs (c) and (d) of this section.

c. Notice.

1) Anticipated bypass. If the Permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of bypass.
2) Unanticipated bypass. The Permittee shall submit notice of an unanticipated bypass as required in paragraph (f)(2) of section 13 (24-hour notice).

d. Prohibition of bypass.

1) Bypass is prohibited, and the Director may take enforcement action against a Permittee for bypass, unless:

a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

c) The Permittee submitted notices as required under paragraph (c) of this section

2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph (d)(1) of this section.

15. Upset [A.R.S. §§ 49-255(8) and 255.01(E), R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(n)]

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph (c) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A Permittee who wishes to establish the affirmative defenses of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1) An upset occurred and that the Permittee can identify the cause(s) of the upset;

2) The permitted facility was at the time being properly operated; and

3) The Permittee submitted notice of the upset as required in paragraph (f)(2) of Section 13 (24-hour notice).

4) The Permittee has taken appropriate measure including all reasonable steps to minimize or prevent any discharge or sewage sludge use or disposal that is in violation of the permit and that has a reasonable likelihood of adversely affecting human health or the environment per A.R.S. § 49-255.01(E)(1)(d)

d. Burden of proof. In any enforcement proceeding the Permittee seeking to establish the occurrence of an upset has the burden of proof.

16. Existing Manufacturing, Commercial, Mining, and Silvicultural Dischargers [R18-9-A905(A)(3)(b) which incorporates 40 CFR 122.42(a)]

In addition to the reporting requirements under 40 CFR 122.41(l) (which is incorporated at R18-9-A905(A)(3)(a)), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

1) One hundred micrograms per liter (100 µg/l);

2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

3) Five times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7) (which is incorporated at R18-9-A905(A)(1)(b)); or

4) The level established by the Director in accordance with 40 CFR 122.44(f) (which is incorporated at R18-9-A905(A)(3)(d)).

b. That any activity has occurred or will occur which would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

1) Five hundred micrograms per liter (500 µg/l);

2) One milligram per liter (1 mg/l) for antimony;

3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7)(which is incorporated at R18-9-A905(A)(1)(b));

4) The level established by the Director in accordance with 40 CFR 122.44(f) (which is incorporated at R18-9-A905(A)(3)(d)).

17 Publicly Owned Treatment Works [R18-9-A905(A)(3)(b) which incorporates 40 CFR 122.42(b)]

This section applies only to publicly owned treatment works as defined at ARS § 49-255(5).

a. All POTW's must provide adequate notice to the Director of the following:

1) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the CLEAN WATER ACT if it were directly discharging those pollutants; and

2) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

3) For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharge from the POTW.

b. Publicly owned treatment works may not receive hazardous waste by truck, rail, or dedicated pipe except as provided under 40 CFR 270. Hazardous wastes are defined at 40 CFR 261 and include any mixture containing any waste listed under 40 CFR 261.31 - 261.33. The Domestic Sewage Exclusion (40 CFR 261.4) applies only to wastes mixed with domestic sewage in a sewer leading to a publicly owned treatment works and not to mixtures of hazardous wastes and sewage or septage delivered to the treatment plant by truck.

18. Reopener Clause [R18-9-A905(A)(3)(d) which incorporates 40 CFR 122.44(c)]

This permit shall be modified or revoked and reissued to incorporate any applicable effluent standard or limitation or standard for sewage sludge use or disposal under sections 301(b)(2)(C), and (D), 304(b)(2), 307(a)(2) and 405(d) which is promulgated or approved after the permit is issued if that effluent or sludge standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant or sludge use or disposal practice not limited in the permit.

19. Privately Owned Treatment Works [R18-9-A905(A)(3)(d) which incorporates 40 CFR 122.44]

This section applies only to privately owned treatment works as defined at 40 CFR 122.2.

a. Materials authorized to be disposed of into the privately owned treatment works and collection system are typical domestic sewage. Unauthorized material are hazardous waste (as defined at 40 CFR Part 261), motor oil, gasoline, paints, varnishes, solvents, pesticides, fertilizers, industrial wastes, or other materials not generally associated with toilet flushing or personal hygiene, laundry, or food preparation, unless specifically listed under "Authorized Non-domestic Sewer Dischargers" elsewhere in this permit.

b. It is the Permittee's responsibility to inform users of the privately owned treatment works and collection system of the prohibition against unauthorized materials and to ensure compliance with the prohibition. The Permittee must have the authority and capability to sample all discharges to the collection system, including any from septic haulers or other unsewered dischargers, and shall take and analyze such samples for conventional, toxic, or hazardous pollutants when instructed by the permitting authority. The Permittee must provide adequate security to prevent unauthorized discharges to the collection system.

c. Should a user of the privately owned treatment works desire authorization to discharge non-domestic wastes, the Permittee shall submit a request for permit modification and an application, pursuant to 40 CFR 122.44(m), describing the proposed discharge. The application shall, to the extent possible, be submitted using ADEQ Forms 1 and 2C, unless another format is requested by the permitting authority. If the privately owned treatment works or collection system user is different from the Permittee, and the Permittee agrees to allow the non-domestic discharge, the user shall submit the application and the Permittee shall submit the permit modification request. The application and request for modification shall be submitted at least 6 months before authorization to discharge non-domestic wastes to the privately owned treatment works or collection system is desired.

20. Transfers by Modification [R18-9-B905]

Except as provided in section 21, a permit may be transferred by the Permittee to a new owner or operator only if the permit has been modified or revoked and reissued, or a minor modification made under R18-9-B906, to identify the new Permittee and incorporate such other requirements as may be necessary.

21. Automatic Transfers [R18-9-B905]

An alternative to transfers under section 20, any AZPDES permit may be automatically transferred to a new Permittee if:

a. The current Permittee notifies the Director at least 30 days in advance of the proposed transfer date;

b. The notice includes a written agreement between the existing and new Permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

The Director does not notify the existing Permittee and the proposed new Permittee of his or her intent to modify or revoke and reissue the permit. A modification under this subparagraph may also be a minor modification under R18-9-B906(B).

22. Minor Modification of Permits [R18-9-B906(B)]

Upon the consent of the Permittee, the Director may modify a permit to make the corrections or allowances for changes in the permitted activity listed in this section, without following public notice procedures under R18-9-A907 or A908. Minor modifications may only:

a. Correct typographical errors;

b. Update a permit condition that changed as a result of updating an Arizona water quality standard;

c. Require more frequent monitoring or reporting by the Permittee;

d. Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement;

e. Allow for a change in ownership or operational control of a facility where the Director determines that no other change in their permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new Permittee has been submitted to the Director.

f. Change the construction schedule for a discharger which is a new source. No such change shall affect a discharger's obligation prior to discharge under 40 CFR 122.29 (which is incorporated by reference in R18-9-A905(A)(1)(e)).

g. Delete a point source outfall when the discharge from that outfall is terminated and does not result in discharge of pollutants from other outfalls except in accordance with the permit limits.

h. Incorporate conditions of a POTW pretreatment program that has been approved in accordance with the procedures in 40 CFR 403.11 and 403.18 as enforceable conditions of the POTW's permit.

Annex an area by a municipality.

23. Termination of Permits [R-9-B906(C)]

The following are causes for terminating a permit during its term, or for denying a permit renewal application:

a. Noncompliance by the Permittee with any condition of the permit;

b. The Permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the Permittee's misrepresentation of any relevant facts at any time;

c. A determination that the permitted activity endangers human health or the environment and can only by regulated to acceptable levels by permit modification or termination; or

d. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit (for example, a plant closure or termination of discharge by connection to a POTW).

24. Availability of Reports [Pursuant to A.R.S § 49-205]

Except for data determined to be confidential under A.R.S § 49-205(A), all reports prepared in accordance with the terms of this permit shall be available for public inspection at ADEQ offices. As required by A.R.S. § 49-205(B) and (C), permit applications, permits, and effluent data shall not be considered confidential.

25. Removed Substances [Pursuant to Clean Water Act Section 301]

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

26. Severability [Pursuant to A.R.S § 49-324(E)]

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and remainder of this permit, shall not be affected thereby.

27. Civil and Criminal Liability [Pursuant to A.R.S § 49-262, 263.01, and 263.02]

Except as provided in permit conditions on "Bypass" (Section 14) and "Upset" (Section 15), nothing in this permit shall be construed to relieve the Permittee from civil or criminal penalties for noncompliance.

28. Oil and Hazardous Substance Liability [Pursuant to Clean Water Act Section 311]

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties to which the Permittee is or may be subject under Section 311 of the Clean Water Act.

29. State or Tribal Law [Pursuant to R18-9-A904(C)]

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any applicable State or Tribal law or regulation under authority preserved by Section 510 of the Clean Water Act.

ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM (AZPDES)

FACT SHEET

This document gives pertinent information concerning the issuance of the AZPDES permit listed below. This facility is minor facility under the NPDES program. The effluent limitations contained in this permit will maintain the Water Quality Standards listed in Arizona Administrative Code (AAC.) R18-11-101 et. seq. This permit is proposed to be issued for a period of 5 years.

Permittee's Name:	City of Tucson Lakeside Park Lake
Mailing Address:	100 N. Stone Ave – 2nd Floor Tucson, AZ 85701
Facility Location:	8300 E. Stella Road Tucson, AZ
Contact Person(s):	Francis LaSala 520-791-5414
AZPDES Permit No.	AZ0024201
Inventory No	105642

I. STATUS OF PERMIT(s)

The City of Tucson has applied for a new Arizona Pollutant Discharge Elimination System (AZPDES) permit to allow the discharge of groundwater and tertiary treated domestic wastewater from the City of Tucson Reclaimed Water System (TRWS) to the Lakeside Park Lake in Pima County, Arizona. This application was received by the Arizona Department of Environmental Quality (ADEQ) on April 17, 2005. The City currently is applying for an Aquifer Protection Permit (APP) No. P105642 and a Reuse Permit No. R100806, both issued by ADEQ for discharges from the TRWS. The APP will regulate discharges to the local aquifer and the Reuse permit will regulate the practice of reusing the treated wastewater for irrigation.

II. GENERAL FACILITY INFORMATION

Lakeside Lake (Lake) is a 13 acre engineered impoundment located at Chuck Ford Lakeside Park in Tucson, AZ. The Lake is within the natural drainage of Atterbury Wash. It is managed by the city of Tucson Parks and Recreation Department as an urban fishing area. It is stocked by the Arizona Game and Fish Department.

The Lake was originally constructed between 1907 and 1917. In 1985, a soil cement liner and concrete shelf at the shore line was added. Sources of water to the Lake were originally stormwater and groundwater from an on-site well. Active Management Area (AMA) restrictions on the use of groundwater for lakes led to the use of reclaimed water for the Lake starting in 1990.

III. RECEIVING WATER

The State of Arizona has adopted water quality standards to protect the designated uses of its surface waters. Streams have been divided into segments and designated uses assigned to these segments. The water quality standards vary by designated use depending on the level of protection required to maintain that use.

The receiving water for the groundwater discharge at Outfall 001 is Lakeside Park Lake in the Santa Cruz River Basin is at:

Outfall 001 is located at: Township 14S, Range 15E, Section 28
Latitude 110° 48' 57.8" N, Longitude 32°11' 15" W

The receiving water for the TRWS discharge at Outfall 002 is Lakeside Park Lake in the Santa Cruz River Basin is at:

Outfall 002 is located at: Township 14S, Range 15E, Section 28
Latitude 110° 48' 58" N, Longitude 32°11' 15" W

Lakeside Lake has been determined to be impaired for dissolved oxygen, ammonia, nutrients and pH. A Total Maximum Daily Load (TMDL) has been developed for the Lakeside Park Lake. The outfall discharges to a surface water listed in Appendix B of A.A.C. Title 18, Chapter 11, Article 1.

The Lakeside Park Lake has the following designated uses:

Aquatic and Wildlife warmwater (A&Ww)
Partial Body Contact (PBC)
Fish Consumption (FC)

Given the uses stated above, the applicable narrative water quality standards are described in A.A.C. R18-11-108 and the applicable numeric water quality standards are listed in A.A.C. R18-11-109, and in Appendix A thereof. There are two standards for the Aquatic and Wildlife uses, acute and chronic. In developing AZPDES permits, the standards for all applicable designated use are compared and limits that will protect for all applicable designated uses are developed based on the standards. Additional limits for impaired parameters included in the TMDL for Lakeside Lake are included in the draft permit.

IV. DESCRIPTION OF DISCHARGE

Groundwater from on-site well PK-009A may be pumped directly to the Lake through Outfall 001. Reclaimed water from the TRWS is discharged through Outfall 002. Water in the TRWS is predominately effluent from the Roger Road Wastewater Treatment Plant (WWTP), but also may include groundwater and effluent from the Randolph Park Water Reclamation Facility. Both Outfalls are expected to be used together during the times of high temperatures and evaporation rates (summer months).

Groundwater flow is approximately 95 gallons per minute (gpm) or 0.137 MGD. Groundwater is typically discharged to the Lake continuously from mid April through mid September, but beginning an ending dates vary with temperature and amounts of precipitation.

Reclaimed water flow is approximately 170 gpm or 0.245 MGD. When used the reclaimed water system will discharge continuously. The reclaimed water will be used to supplement groundwater discharges when evaporation rates are high. This is expected to be through parts of June, July and August.

The application included data from the on-site groundwater well and for reclaimed water from point 522 (the point where reclaimed water enters the reclaimed water distribution system). Further details regarding these data are presented in sections that follow.

V. STATUS OF COMPLIANCE

The facility does not have an AZPDES permit. The facility was informed by ADEQ in 1996 that a NPDES permit was required for the discharges to Lakeside Lake. A Consent Order was issued to the City of Tucson on January 28, 2005, which requires the City to apply for an AZPDES permit.

VI. DETERMINATION OF EFFLUENT LIMITATIONS and ASSESSMENT LEVELS (Part I in Permit)

When determining what parameters need monitoring and or limits included in the draft Lakeside Park Lake permit, both technology-based and water quality-based criteria were compared and the more stringent criteria applied.

Technology-based Limitations:

There are no technology based limits applicable to this discharge.

Numeric Water Quality Standards: As outlined in A.A.C. R18-11-109 and Appendix A:
Per 40 CFR 122.44(d)(1)(ii), (iii) and (iv), discharge limits must be included in the permit for parameters with 'reasonable potential', that is, those known to be or expected to be present in the effluent at a level that could potentially cause any applicable numeric water quality standard to be exceeded. "Reasonable potential" refers to the possibility, based on the statistical calculations using the data submitted, or consideration of other factors to determine whether the discharge may exceed the Water Quality Standards. The procedures used to determine reasonable potential are outlined in the *Technical Support Document for Water Quality-based Toxics Control (TSD)* (EPA/505/2-90-001). In most cases, the highest reported value for a parameter is multiplied by a factor (determined from the variability of the data and number of samples) to determine a "highest estimated value". This value is then compared to the lowest applicable Water Quality Standard for the receiving water. If the value is greater than the standard, RP exists and a limit is required in the permit. RP may also be determined from best professional judgment (BPJ) based on knowledge of the treatment facilities and other factors. The basis for the RP determination for each parameter with a limit is shown in the table below.

However, reasonable potential (RP) could not be calculated for some parameters due to lack of data or detection levels above the standard as indicated in the table which follows. Numeric Discharge Limits (limits) were not placed on these pollutants in the permit. However, monitoring for these pollutants is required and assessment levels (ALs) are established. ALs serve to advise the permittee of the analytical sensitivity needed for data collection. ALs also alert the permitting authority if the discharge may have the potential to exceed water quality criteria. In such a case, the permit could be reopened and modified to include limit(s) if RP is shown. In any event, RP will be re-evaluated based on the collected data before a renewal of this permit could be issued in the future. For a number of other pollutants, discharge characterization (EC) monitoring is required at a lesser frequency and without established ALs or numeric

limits (Tables 3.a. – 3.f in the draft permit).

It is assumed that RP exists for exceedance of water quality criteria for the pollutants *E. coli* and total residual chlorine (TRC) for the reuse water discharge to Outfall 002. Water in the TRWS is partially from publicly owned treatment works (POTWs). These parameters have been shown through extensive monitoring of POTWs to fluctuate greatly and thus are not conducive to exclusion from limitation due to a lack of RP. Therefore the draft permit contains numeric limits for *E. coli* and TRC.

The proposed permit limits and/or ALs were established using a methodology developed by EPA. Long Term Averages (LTA) were calculated for each designated use and the lowest LTA was used to calculate the average monthly limit (AML) and maximum daily limit (MDL) necessary to protect all uses. This methodology takes into account criteria, effluent variability, and the number of observations taken to determine compliance with the limit and is described in Chapter 5 of the TSD. Limits/ALs based on A&W criteria were developed using the "two-value steady state wasteload allocation" described on page 99 of the TSD. When the limit/AL is based on human health criteria, the monthly average was set at the level of the applicable standard and a daily maximum limit was determined as specified in Section 5.4.4 of the TSD.

The permittee applied for and the draft permit includes, a mixing zone for ammonia, chlorine, ortho-phosphorus, and chronic and acute whole effluent toxicity (WET) for discharges from Outfall 002. The TMDL also establishes in-Lake limits for dissolved oxygen and chlorophyll-a and the draft permit includes Lake monitoring for those parameters. All other limits and/or assessment levels apply at the end of the pipe.

Permit Limitations and Monitoring Requirements: The tables that follow summarize parameters that are limited in the permit and the rationale for that decision. Also included are some parameters that require monitoring without any limitations or that have not been included in the permit at all and the basis for that decision. The corresponding monitoring requirements are shown for each parameter. In general, the regulatory basis for monitoring requirements is per 40 CFR §122.44(i) *Monitoring requirements*; and 40 CFR §122.48(b), *Required monitoring*; both of which have been adopted by reference in R18-9-A905, *AZPDES Program Standards*.

Parameter	Lowest Standard/ Designated Use	Outfall	Maximum Reported Daily Value	No. of Samples	Estimated Maximum Value	RP determination	Proposed Monitoring Requirement/ Rationale
Flow	- - -		- - -	- - -	- - -	- - -	It is proposed that discharge flow be estimated.
pH	Minimum: 6.5 Maximum: 9.0 Maximum change due to discharge: 0.5/ A&Wedw, and PBC A.A.C.R 18-11-109(B)	001	6.86 to 7.22	7	NA	Limit is always included.	pH is to be monitored once weekly using a discrete sample of the effluent. 40 CFR Part 136 specifies that grab samples must be collected for pH. At least one sample must coincide with WET testing to aid in the determination of the cause of toxicity if toxicity is detected. pH sampling must also coincide with ammonia sampling when required.
		002	6.83 to 7.96	18	NA	Limit is always included.	
Temperature	No applicable standard	001	23.18 to 24.47	7	NA	No RP. Monitoring and reporting required.	Effluent temperature is to be monitored weekly at 002 for effluent characterization by discrete sample. 40 CFR Part 136 specifies that discrete samples must be collected for temperature. Additionally, one sample must coincide with WET sampling to aid in the determination of the cause of toxicity, if toxicity is detected. Temperature is also required with ammonia sampling.
		002	14.8 to 31.8	18	NA		
Ammonia	Standard is dependant on pH and temperature	001	0.25 mg/L	1	NA	No RP	Ammonia is to be monitored annually for effluent characterization by discrete sample.
		002	29 mg/L	50	NA	RP exists	Ammonia is to be monitored weekly in the discharge. A mixing zone is proposed for ammonia. Sampling is also required in the mixing zone. Acute and chronic ammonia criteria must be met at specific locations in the Lake.
Antimony	Applicable standard of 30 ug/l A&Ww	001	<5 ug/L	1	9.7 (3)	No RP	Monitoring required annually for effluent characterization.
		002	< 5 ug/L	7	8.8 (4)		
Arsenic	190 ug/L/ A&Ww chronic	001	<2 ug/L	1	3.9 (3)	No RP	
		002	6.4 ug/L	7	22.4		
Beryllium	5.3 ug/L/ A&Ww chronic	001	No data	0	NA	Indeterminate	Monitoring required 2 times per year and an assessment level is set
		002	< 2 ug/L	7	3.5 (4)	No RP	Monitoring required annually for effluent characterization
Cadmium (2)	2.7 ug/L/ A&Ww chronic	001	No data		NA	Indeterminate No data	Monitoring required 2 times per year and an assessment level is set.
		002	< 4 ug/L	7	7 (4)	Indeterminate Detection level is above standard	
Chromium (total) (increased monitoring)	100 ug/L/ PBC	001	<20 ug/L	1	39 (3)	No RP	Monitoring required annually for effluent characterization.
		002	<20 ug/L	7	35 (4)		
Chromium VI	11 ug/L/ A&Ww chronic	001	No data	NA	NA	Indeterminate	Monitoring required 2 times per year and an assessment level is set.
		002	No data	NA	NA		
Copper (2)	11.2 ug/L/ A&Ww chronic	001	<20 ug/L	1	NA	Indeterminate detection level above standard	Monitoring required 2 times per year and an assessment level is set.
		002	ug/L	25	21 (4)	RP exists BPJ Data from Roger road WWTP indicates copper is frequently above 11 ug/L	Monitoring required monthly and a limit is set.
Cyanide	9.7 ug/L/ A&Ww	001	<25	1	NA	Indeterminate detection level above standard	Monitoring required 2 times per year and an assessment level is set.

Parameter	Lowest Standard/ Designated Use	Outfall	Maximum Reported Daily Value	No. of Samples	Estimated Maximum Value	RP determination	Proposed Monitoring Requirement/ Rationale
		002	68 ug/L		Standard has been exceeded	RP exi	Monitoring required and a limit is set.
E. Coli	30-day geometric mean: 126 cfu /100 mL (4 sample minimum) Single sample maximum: 576 cfu /100 mL/ PBC	001	Non detect	1	NA	RP	Monitoring required annually for discharge characterization
		002	<1 1 mpn	10	NA	RP always exists for reclaimed water	*E. coli* is to be monitored weekly using a grab sample of the discharge. Four samples are required to ensure compliance with the 30-day geometric mean water quality standards. 40 CFR Part 136 specifies that grab samples must be collected for coliform bacteria. At least one sample per month must coincide with WET testing to aid in the determination of cause of toxicity if toxicity is detected
Fecal Coliform	No Applicable Standard	001, 002	---	---	---	NA	No monitoring required
Hardness	No Applicable Standard. Hardness of the receiving water is used to determine standards for specific metal parameters.	001, 002	307 mg/L		NA	NA	A&W standards for cadmium, chromium III, copper, lead, nickel, silver and zinc used for RP determinations were based on the average hardness value of 130 mg/L. Monitoring for hardness is required whenever monitoring for hardness dependent metals is required.
Lead (2)	3.34 ug/L / A&Ww chronic	001	<2 ug/L	1	3.9 (3)	Indeterminate- less than 10 samples all non detect, but detection level close to standard	Monitoring is required 2X/ year and an assessment level is set.
		002	< 2 ug/L	7	3.5 (4)		
Mercury	01 ug/L/ A&Ww chronic	001	<0.5 ug/L	1	NA	Indeterminate- detection level is above standard	Monitoring is required 2X/ year and an assessment level is set.
		002	<0.5 ug/L	7	NA		
Nickel (2)	64.9 ug/L/ A&Ww chron	001	<20 ug/L	1	39 (3)	No RP	Monitoring is required annually for discharge characterization.
		002	<20 ug/L	7	35(4)		
Nutrients	TMDL sets nutrient limits for total phosphorous of 0.4 mg/L for the discharge and an in-lake limit on orthophosphorus of 0.009 mg/L	001	0.033 mg/L total P	3	NA	No	Monitoring is required annually for discharge characterization.
		002	3.8 mg/L mg/L total P	52	NA	RP exists	Monitoring is required weekly and a limit is set for total and ortho-phosphorus. A mixing zone is proposed for ortho-phosphorus. Monitoring is also required in the mixing zone for ortho-phosphorus.
Oil and grease	R18-11	001, 002	N	NA	NA	indeterminate	No data. Monitoring is required 2X /year. An assessment level is set.
Selenium	A&Ww chronic	001	<5 ug/L	1	NA	Indeterminate detection level above the standard	Monitoring is required 2X /year. An assessment level is set.
		002	<5 ug/L	7	NA		
Silver (2)	5.42 ug/L/ A&Ww acute	001	No data	---	NA	Indeterm ate no data	Monitoring is required 2X /year. An assessment level is set.
		002	<20 ug/L	7	NA	Indeter nate detecti level above standard	

Parameter	Lowest Standard/ Designated Use	Outfall	Maximum Reported Daily Value	No. of Samples	Estimated Maximum Value	RP determination	Proposed Monitoring Requirement/ Rationale
Sulfides	100 ug/L/ A&Ww acute	001, 002	No data	NA	NA	indeterminate	Monitoring is required 2X /year. An assessment level is set.
Thallium	7.2 ug/L/ FC	001	No data	---	NA	indeterminate	Monitoring is required 2X /year. An assessment level is set.
		002	<2 ug/L	7	3.5 (4)	No RP	Monitoring required annually for effluent characterization.
Total Residual Chlorine	5 ug/L/ A&Wedw chronic	001	No data	---	---	No RP - BPJ	No monitoring required unless chlorination of groundwater occurs.
		002	7800 ug/L	47	NA	RP exists – mixing zone is proposed	Weekly monitoring of discharge and mixing zone is required. Limit must be meant at specified locations in the mixing zone. TRC is to be monitored daily as a discrete sample. 40 At least one sample per month must coincide with required WET testing to aid in the determination of the cause of toxicity if toxicity is detected
Whole Effluent Toxicity (WET)	No toxicity (A.A.C. R18-11-108.A.6)	001	*Selenastrum capricornutum*	No data	---	Indeterminate No data	Monitoring is required annually and an action level is set in the permit.
		001	*Pimephales promelas*	No data	---	Indeterminate No data	Monitoring is required annually and an action level is set in the permit.
		001	*Ceriodaphnia dubia*	No data	---	Indeterminate No data	Monitoring is required annually and an action level is set in the permit.
		002	*Selenastrum capricornutum*	No data	---	Indeterminate No data	Monitoring is required annually and an alert level is set in the permit. A mixing zone is proposed.
		002	*Pimephales promelas*	No data	---	RP exists for both acute and chronic toxicity based on ammonia levels in discharge.	Monitoring is required annually and a limit is set in the permit. A mixing zone is proposed.
		002	*Ceriodaphnia dubia*	No data	---	RP exists for both acute and chronic toxicity based on chlorine levels in discharge	Monitoring is required annually and a limit is set in the permit. A mixing zone is proposed.
Zinc (2)	146 ug/L/ A&W w acute	001	21 ug/L	1	81.9 (3)	No RP	Monitoring required annually for effluent characterization.
		002	35 ug/L	7	122.5 (4)	No RP	Monitoring required annually for effluent characterization.

Footnotes:

(1) The monitoring frequencies above are required when the facility is discharging through Outfall 001 or 002 as specified. If there is no discharge, monitoring shall be conducted at least once per calendar year for these parameters for parameters in Tables 3.a and 3.b of the permit and 3 times in the permit term for parameters in Tables 3c through 3.e of the permit. The resulting data is needed to characterize the effluent.
(2) The standard for this parameter is based on a hardness value of 130 mg/ L.
(3) When calculating estimated maximum values for discharges to Outfall 001 a coefficient of variation of 0.3 was assumed, since groundwater is expected to have relatively low variations in quality.
(4) When calculating estimated maximum values for discharges to Outfall 002 a coefficient of variation of 0.6 was assumed when data was all non detect. This is the default value for effluent from wastewater treatment plants

Assessment Levels:

Assessment levels (ALs) are established in the draft permit for selected metals, cyanide and oil and grease.. The basis for establishing ALs for each of these parameters is discussed in the table in Section VII above. ALs are listed in Part I.B of the permit. An AL differs from a discharge limit in that an exceedance of an AL is not a permit violation. Instead, ALs serve as triggers, alerting the permitting authority when there is cause for re-evaluation of RP for exceeding a water quality standard, which may result in new permit limitations. The AL numeric values also serve to advise the permittee of the analytical sensitivity needed for meaningful data collection. Trace substance monitoring is required when there is no RP or uncertain RP (based on non-detect values, or limited datasets) or a need to collect additional data or monitor treatment efficacy on some minimal basis. A reopener clause is included in the draft permit should future monitoring data indicate water quality standards are being exceeded

The requirement to monitor for these parameters is included in the draft permit according to A.A.C. R18-11-109(A) and Appendix A. ALs listed for each parameter were calculated in the same manner that a limit would have been calculated (See Numeric Water Quality Standards Section above.)

The permittee is required to sample the receiving water for hardness as $CaCO_3$ at the same time the trace metals are sampled because the water quality standards for some metals are calculated using the water hardness values. The hardness value of 130 mg/L (the average hardness of the receiving water) was used to calculate the assessment levels for cadmium, copper, lead, nickel, silver and zinc.

The following trace substances were not included in the draft permit due to a lack of RP based on best professional judgment (BPJ): barium and manganese. The numeric standards for these pollutants are well above what would be expected from the discharges.

Effluent Characterization Testing

In addition to monitoring for parameters assigned either a permit limit or an AL, sampling is required to assess the presence of pollutants in the discharge at certain minimum frequencies for additional suites of parameters, whether the facility is discharging or not. This monitoring is specified in Tables 3.a through 3.f., *Effluent Characterization Testing,* as follows:

- Table 3.a. – ammonia, total residual chlorine, dissolved oxygen, E. Coli, total Kjeldahl nitrogen, Nitrate/nitrite, oil and grease, pH, ortho and total phosphorus, temperature, and total dissolved solids.
- Table 3.b. - Selected Metals (Total Recoverable), Hardness, and Cyanide. Data from monitoring done per Table 1 or 2 may be used.
- Table 3.c. – Selected Volatile Organic Compounds
- Table 3. d. – Selected Acid-extractible Compounds
- Table 3. e. – Selected Base-Neutral Compounds

  Table 3.f. – Additional Parameters Based on Designated Uses (from Arizona Surface Water Quality Standards, Appendix A, tables 1 and 2.)

NOTE: Some parameters listed in Tables 3.a. and 3.b. are also listed in Tables 1, 1a, or 2. In this case, the data from monitoring under Tables 1 or 2 may be used to satisfy the requirements of Tables 3.a. and/or 3.b., provided the specified sample types are the same. In the event the facility does not discharge to a water of the U.S. during the life of the permit, Effluent Characterization Testing, of representative samples of the effluent, is still required.

The purpose of *Effluent Characterization (EC) Testing* is to characterize the effluent and determine if the parameters of concern are present in the discharge and at what levels. This monitoring will be used to assess RP per 40 CFR 122.44(d)(1)(iii EC monitoring is required in accordance with 40 CFR 122.43(a), 40 CFR 122.44(i), and 40 CFR 122.48(b) as well as ARS49-203(A)(7). If pollutants are noted at levels of concern during the permit term, this permit may also be reopened to add related limits or conditions.

Whole Effluent Toxicity:

Whole Effluent Toxicity (WET) testing is required in the draft permit (Parts I.E. and III) to evaluate the discharge according to the narrative toxic standard in AAC R18-11-108(A)(5), as well as whether the discharge has RP for WET per 40 CFR 122.44(d)(iv).

ADEQ does not have a numeric standard for Whole Effluent Toxicity. However, ADEQ adopted the EPA recommended chronic toxicity benchmark of 1.0 TUc for a four day exposure period. Using this benchmark, the limitations and action levels for WET included in the draft permit were calculated in accordance with the methods specified in the *TSD*. The species chosen for WET testing are as recommended in the *TSD* and in *Regions 9 & 10 Guidance for Implementing Whole Effluent Toxicity Testing Programs*.

The draft permit requires monitoring for three surrogate species [*Ceriodaphnia dubia* (water flea) representing the invertebrate phyla; *Pimephales promelas* (fathead minnow), a vertebrate species; and *Selenastrum capricornutum* (green alga) for evaluating toxicity to plant life]. Monitoring is required once in the permit term for Outfall 001 and annually for Outfall 002. Limits have been set for *Ceriodaphnia dubia* and *Pimephales promelas* for discharges from Outfall 002; the limits are applicable at the designated monitoring location in the mixing zone (see Part IV of the permit). An exceedance of a limit or action level will trigger follow-up testing to determine if effluent toxicity is persistent. If toxicity above a limit or action level is found in a follow-up test, the permittee will be required to conduct a TRE and possibly a TIE to identify the source of toxicity and reduce toxicity. These conditions are required to ensure that toxicants are not discharged in amounts that are toxic to organisms [A.A.C. R18-11-108(A)(5)]. A reopener clause is included in accordance with 40 CFR Parts 122 and 124 and AAC R18-9-B906.

The required WET monitoring frequency for this facility is consistent with the WET testing frequency required for facilities with similar discharge flows. The draft permit requires WET test results to be reported on discharge monitoring reports and submittal of the full WET lab report to ADEQ.

Parameter	Proposed Monitoring Requirement
Whole Effluent Toxicity (WET)	WET testing for chronic toxicity shall be conducted once in the permit term for Outfall 001. A mixing zone is proposed for both acute and chronic toxicity for discharges of reclaimed water from Outfall 002. Mixing zone monitoring is required annually one month after discharge from Outfall 002 is begun or at termination of the discharge whichever if the discharge is for less than one month. A more frequent sampling requirement is triggered if any of the WET action levels listed in the permit are exceeded. The permit also contains provisions for investigating the sources of toxicity, if detected. Three discrete samples are required to complete one WET test. For Outfall 001. WET tests in the mixing zone for discharges from Outfall 002 shall be a composite of depth samples. WET sampling must coincide with testing for all the parameters in Tables 1 and 2 of the draft permit to aid in the determination of the cause of toxicity if toxicity is detected. Additional procedural requirements for the WET test are included in the proposed permit.

VII. NARRATIVE WATER QUALITY STANDARDS

All narrative limitations in A.A.C. R18-11-108 that are applicable to the receiving water are included in Part I, Section F and G of the draft permit.

VIII. MONITORING AND REPORTING REQUIREMENTS (Part II of Permit)

Section 308 of the Clean Water Act and 40 CFR Part 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Additionally, monitoring may be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. The permittee has the responsibility to determine that all data collected for purposes of this permit meets the requirements specified in this permit and is collected, analyzed, and properly reported to ADEQ.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee is responsible for conducting and reporting results to ADEQ and on DMRs or otherwise specified in the permit.

Monitoring locations are specified in the permit Part I.A.1, Part I.H and Part IV.C in order to ensure that representative samples of the influent and effluent are consistently obtained.

Part II. A of the permit requires the permittee to keep a Quality Assurance (QA) manual at the facility, describing sample collection and analysis processes; the required elements of the QA manual are outlined. In addition, all surface water monitoring must be conducted in accordance with the requirements of A.A.C. R18-11-602.

For purposes of this permit, an "8-hour composite" sample has been defined as a flow-proportioned mixture of not less than 2 discrete samples (aliquots) obtained at equal time intervals. The volume of such aliquots shall be directly proportional to the discharge flow rate at the time of sampling.

These criteria for composite sampling are included in order to obtain samples that are representative of the discharge given the potential variability in the duration, frequency and magnitude of discharges from this facility. Information in the application indicates that the discharges are likely to be continuous for some portion of the summer months.

Discrete (i.e., grab) samples are specified in the permit for parameters that for varying reasons are not amenable to compositing.

Reporting requirements for monitoring results are detailed in Part II.B.1 of the permit, including completion and submittal of Discharge Monitoring Reports (DMRs) and AZPDES Flow Record forms.

The permit also requires monthly submittal of an ammonia data log that records the results for temperature, pH, and ammonia samples and date of sampling (Part II. B. 2.). This requirement is included because the normal method of reporting sampling results (on DMRs) is not sufficient for determining what standard applies. The ammonia standards in Appendix A are contingent upon the pH and temperature at the time of sampling for ammonia; but the format for reporting on DMRs does not link a sample to its particular date of sampling. The requirement to submit an ammonia data log is included to allow evaluation of compliance with ammonia limitations and mixing zone conditions. and the potential for toxicity in the discharge based on ammonia.

Requirements for retention of monitoring records are detailed in Part II. D of the permit.

IX. SPECIAL CONDITIONS (Part IV in Permit)

Mixing Zone Conditions

The draft permit proposes a mixing zone for ammonia, chlorine, ortho-phosphorous and whole effluent toxicity. A mixing zone study was not conducted. The maximum extent of the chronic mixing zone was selected as an arc 250 feet from the discharge point. This gives the chronic mixing zone an area of approximately 1.1 acres. Mixing zones can be no greater than 10 % of the Lake surface area by A.A.C. R18-11-114. The acute mixing zone is established by an arc 125 feet from the discharge point or approximately 0.28 acre. Monitoring of the mixing zone is required and locations for compliance with the permit limits and or action levels are specified.

Lake Management Requirements

The draft permit requires the permittee to develop and submit for approval by October 1, 2007, a Lake Management Plan (LMP). The LMP will describe how the Lake will be managed (including addition all monitoring) to assure compliance with permit conditions. This is a requirement of the TMDL. The permit specifies minimum Lake monitoring that must be included in the LMP. In addition, the LMP must include steps need to implement alum additions to the Lake if needed to maintain required phosphorous levels at discharge or in the Lake. Use of alum to reduce phosphorous in the reclaimed water prior to discharge was the preferred choice for Lake management in the TMDL.

Lake Monitoring Requirements

In addition to the parameters with mixing zones, the Lake shall be monitored for chlorphyll-a, dissolved oxygen, and nitrate/nitrite. The draft permit contains limits for chlorophyll-a and dissolved oxygen in the Lake. These limits are the target thresholds given in the TMDL. The TMDL does not give a numeric target for nitrate/nitrite, but requires that all nitrogen species be included in the TMDL monitoring plan.

Permit Reopener

This permit may be modified based on newly available information; to add conditions or limits to address demonstrated effluent toxicity; to implement any EPA-approved new Arizona water quality standard; or to re-evaluate reasonable potential (RP), if Assessment Levels in this permit are exceeded (AAC R18-9-B906, and 40 CFR Part 122.62 (a) and (b)).

X. ANTIDEGRADATION

Antidegradation rules have been established under A.A.C. R18-11-107 to ensure that existing surface water quality is maintained and protected.

Lakeside Lake is located what was once an ephemeral wash and is intended to be filled with stormwater. However, to maintain the water elevations both groundwater and reclaimed water are added to the Lake between rainfall events. The Lake will have different water quality depending on time since the last significant rainfall event, amount of groundwater and/or reuse water added to the Lake. The Lake does not have a uniform baseline water quality. Therefore, as long as the discharges to the Lake and Lake monitoring meet the conditions of this permit, the requirements of

antidegradation are considered met.

There is little water quality available on the Lake for parameters other than those studied for the TMDL (nutrients, dissolved oxygen, chlorophyll-a).

XI. STANDARD CONDITIONS

Conditions applicable to all NPDES permits in accordance with 40 CFR, Part 122 are attached as an appendix to this permit.

XIII. ADMINISTRATIVE INFORMATION

Public Notice (A.A.C. R18-9-A907)
The public notice is the vehicle for informing all interested parties and members of the general public of the contents of a draft AZPDES permit or other significant action with respect to an AZPDES permit or application. The basic intent of this requirement is to ensure that all interested parties have an opportunity to comment on significant actions of the permitting agency with respect to a permit application or permit. This permit will be public noticed in a local newspaper after a pre-notice review by the applicant and other affected agencies.

Public Comment Period (A.A.C. R18-9-A908)
Rules require that permits be public noticed in a newspaper of general circulation within the area affected by the facility or activity and provide a minimum of 30 calendar days for interested parties to respond in writing to ADEQ. After the closing of the public comment period, ADEQ is required to respond to all significant comments at the time a final permit decision is reached or at the same time a final permit is actually issued.

Public Hearing (A.A.C R18-9-A908(B))
A public hearing may be requested in writing by any interested party. The request should state the nature of the issues proposed to be raised during the hearing. A public hearing will be held if the Director determines there is a significant amount of interest expressed during the 30-day public comment period, or if significant new issues arise that were not considered during the permitting process.

EPA Review (A.A.C. R18-9-A908(C))
A copy of this draft permit and any revisions made to this draft as a result of public comments received, will be sent to EPA Region 9 for review. If EPA objects to a provision of the draft, ADEQ will not issue the permit until the objection is resolved.

XV. ADDITIONAL INFORMATION

Additional information relating to this proposed permit may be obtained from:

ADEQ
Water Quality Division- Surface Water Permits Unit
Attn: **Debra Daniel**
1110 W. Washington St.
Phoenix, Arizona 85007

or, by contacting Debra Daniel at (602) 771-4689

XVI. INFORMATION SOURCES

While developing effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used:

1 NPDES Permit Application Form 2A, received August 17, 2005, and along with supporting data, facility diagram and maps submitted by the applicant with the application form.

2 Lakeside Lake TMDL, Nutrients and Associated Parameters, ADEQ with PBS&J, February 9, 2005.

3. Arizona Administrative Code (AAC) Title 18, Chapter 11, Article 1, *Water Quality Standards for Surface Waters,* adopted March 31, 2002.

4. AAC Title 18, Chapter 9, Article 9. *Arizona Pollutant Discharge Elimination System* rules

5. Code of Federal Regulations (CFR) Title 40:
Part 122, *EPA administered permit programs: The National Pollutant Discharge Elimination System.*
Part 124, *Procedures for decisionmaking.*

6. EPA Technical Support Document for Water Quality-based Toxics Control dated March, 1991

7 *Regions 9 & 10 Guidance for Implementing Whole Effluent Toxicity Testing Programs*, US EPA, May 31, 1996.

8. *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA /821-R-02-013).

9. *U.S. EPA NPDES Permit Writers' Manual,* December 1996.

Section VII from the Draft Sampling and Analysis Plan for the ADEQ Lakes Program.
We intend to employ similar methodology for Lakeside sampling

VII. FIELD METHODS

1. Field measurements and equipment (see LPM):

The Lakes Program uses one of three boats, depending upon the size of the lake and ease of access. Field measurements of physical/chemical water conditions are taken using either a Hydrolab H2O or a YSI 6600 datasonde (multiprobe). Parameters measured include depth, temperature, dissolved oxygen (DO) in mg/L and percent saturation, pH, electrical conductivity (EC), Redox potential (ORP), and TDS at a minimum. These depth profile measurements indicate the degree of stratification in the water column and assist with the decision of where to pull water samples. Multi-probe data are stored and later downloaded directly to the database. Air temperature and current conditions are also recorded.

Water clarity is measured using a Secchi Disk dropped to the point at which it disappears from view. Clarity is also measured using a Hach Turbidimeter 2100.

2. Sample collection procedures and equipment:

Water samples are collected with a Beta bottle. This device is opened and lowered through the water column to the desired depth. A weight is sent down the line to trip the mechanism and a depth-specific sample is collected. The water samples are pulled to the surface and decanted into pre-preserved or non-preserved, pre-labeled sample bottles. Filled bottles are placed on ice in a cooler. For Clean Sampling techniques please refer to the LPM.

Sediment samples are most often collected using a Wildco Corer with a pounder. The Corer is lowered to within three feet of the bottom and the pounder dropped to obtain the sample. The sample is brought to the surface and carefully transferred to the appropriate clean pre-labeled jar, then immediately placed in the cooler.

Biological samples may include water for algae identification, collection of aquatic macrophytes for identification, or a plankton tow. The Eckman Dredge may also be used to collect benthic macro-invertebrates.

3. Field activity documentation:

Pre-prepared field sheets are filled out for each lake sample site. Field sheets are used to record information on date, times, conditions, depth profile readings, sampling depths, secchi depth, turbidity, and anecdotal information on wildlife or human activities. These sheets become a permanent part of the lake site file.

VIII. HEALTH AND SAFETY PLAN

1. Personal safety always has priority over samples and sample collection.

2. General health and safety considerations:

Field work will always involve at least two ADEQ staff

The team will carry sufficient water as well as a first aid kit at all times

Each team member will be responsible to dress appropriately for the conditions, including rain gear and warm dry clothes & foot-wear in the cool season - and hat, sunscreen, appropriate swim-wear, shorts and t-shirts, &non-stick sole sandals in the hot season

Each staff member will be responsible to have the appropriate PFD while on a lake

The pontoon boat is equipped with the following safety items: emergency shut-off, fire extinguisher, flares, first aid kit, PFDs, horn, running lights, depth-finder, and tool box

At least one staff member will have access to a cellular phone in case of emergency

Staff will file a "Field Routing Form" with at least one contact person; the form will outline where and when sampling is planned, where staff will stay when out of town, and emergency phone numbers

Staff are responsible to check in at a regular time each day with the designated contact person when on travel status

3. Special precautions:

Staff will participate in annual OSHA 8-hr Health & Safety training, bi-annual U.S. Coast Guard-approved boat safety training, and regular health exams.

4. Emergency information:

Staff will note the nearest medical facility on the Field Routing Form
Emergency Telephone Numbers: (use 911 where appropriate)

Fire: 911

Police: 911

Ambulance: 911

IX. DATA MANAGEMENT & DATA ANALYSIS

1. Electronic database and access information:

The Lakes Program enters field and lab data into the Water Quality Division's central Oracle-based database. Each staff member has access to this database for data entry from their desktop. Only one staff member, Jennifer Hickman, has access to the query tool "Discover".

2. Description of data entry and verification procedures:

Data is entered within 30 days of receipt on hard copy from the laboratory. Field data are downloaded directly from either the YSI or the Hydrolab. Jennifer is also primarily responsible for data entry and delegation of QC checking/data approval. Once approved, data cannot be changed by anyone other than the system administrator.

3. Description of data entry of graphic data:

still there?

The Lakes Team maintains a film and video archive, as well as a GIS lakes cover. Digital graphics files are maintained on a multi-media stand-alone computer housed in the GIS room. Video, photographic, and digital imagery will be oriented toward documentation of lake and reservoir features, land use, and potential nonpoint sources in the immediate watershed of the lake or reservoir. GIS (ArcView) has been used for watershed delineation, lake bathymetry and volume calculations, and spatial mapping and analysis.

4. Paper file system and location:

A site file is maintained on each lake sampled. Hard copy data-sheets, chain of custody forms, and field sheets are kept in this file and organized according to sampling event. Site files are housed in a locked file room with access limited by the Surface Water Monitoring & Standards Unit only.

5. Description of statistical procedures used to analyze data:

Graphic representation of depth profile data

Frequency distribution histograms of chemical data

Box plots to show data distribution in quartiles; detection of outliers without distribution assumption

Trophic analysis

Test for normalcy in data sets

Appropriate parametric or non-parametric tests for significant difference or relationships between parameters

Multivariate methods for testing parameter groupings; biometrics to test species assemblages in relation to environmental factors

Trend analysis with sufficient long-term data

Mass balance calculations to test relative system equilibrium

X. REPORTING

1. Disposition of information on water quality exceedances:

Water quality data are compiled and evaluated on a regular basis for determination of designated use support. Values are compared with their respective water quality standard (criteria). If an

exceedances is found that can be linked directly to a permit discharge or to a direct discharge that is not permitted but should be permitted, the case is turned over to the relevant compliance entity (ADEQ Water Quality Compliance/Enforcement or the EPA). Nonconformance with standards may be related to nonpoint source discharges or in some cases, to a natural background condition. Further monitoring is required to verify and track such exceedances. Nonpoint source pollution is not regulated in the same way as point source discharges. Sustained standards exceedances which are not based upon a defensible natural background condition may be referred for TMDL analysis or remedied through other means of compliance through partnership with watershed entities.

2. Report(s) to be written:

There is no regular reporting mandate within the Lakes Program per se. However, the Program cooperates in the effort to compile and review data for 305(b) biennial assessment (and annual 205(j) assessments). Reports of varying complexity may be requisitioned by outside parties, as all Lakes Program data are pubic record.

When a lake or reservoir requires a TMDL, the final document is produced in-house but usually relies on contracted modeling and/or alternatives analysis. The TMDL report is noticed in the Arizona Administrative Register for two 45-day comment periods. Upon successful completion of public notice, the TMDL is submitted to the EPA Region IX for approval.

Interim reports are often reviewed by stakeholder groups to ensure accuracy of information and buy-in.

3. List of report recipients: will vary with a particular project. The Assessment Coordinator maintains a list of 305(b) recipients.

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