

NOTICES OF PUBLIC INFORMATION

Notices of Public Information contain corrections that agencies wish to make to their notices of rulemaking; miscellaneous rule-making information that does not fit into any other category of notice; and other types of information required by statute to be published in the *Register*. Because of the variety of material that is contained in a Notice of Public Information, the Office of the Secretary of State has not established a specific format for these notices.

NOTICE OF PUBLIC INFORMATION

DEPARTMENT OF ENVIRONMENTAL QUALITY

- 1. A.R.S. Title and its heading:** 49, The Environment
A.R.S. Chapter and its heading: 2, Water Quality Control
A.R.S. Article and its heading: 2.1, Total Maximum Daily Loads
Section: A.R.S. § 49-234, Total maximum daily loads; implementation plans

2. The public information relating to the listed statute:

Pursuant to A.R.S. § 49-234, the Arizona Department of Environmental Quality (“Department”) is required to develop a total maximum daily load (TMDL) for navigable waters that are listed as impaired. The purpose of this notice is to publish the Department’s determinations of total pollutant loadings for TMDLs that the Department intends to submit to the Regional Administrator for Region 9, U.S. Environmental Protection Agency (“EPA”) for approval.

The Department previously provided public notice and an opportunity for public comment on the “Draft TMDLs for DO, pH, and Narrative Nutrients in Lakeside Lake” in the *Tucson Daily Star*, a newspaper of general circulation in the affected area, on August 12, 2002. The Department did not receive any written comments on the TMDLs during the public notice period. If comments had been received, the Department would have included a summary of the comments and the Department’s responses in this notice. The purpose of this notice is to satisfy A.R.S. §§ 49-234(D) and 49-234(E) which require the Department to publish in the *Arizona Administrative Register* the determination of total pollutant loadings that will not result in impairment and the proposed allocations among the contributing sources that are sufficient to achieve the total pollutant loadings.

3. Total Maximum Daily Loads (TMDLs)

A. Total Maximum Daily Load (TMDL) Process

A Total Maximum Daily Load (TMDL) represents the total load of a pollutant that can be discharged to a water body on a daily basis and still meet the applicable water quality standard. The TMDL can be expressed as the total mass or quantity of a pollutant that can enter the water body within a unit of time. In most cases, the TMDL determines the allowable pounds per day of a pollutant and divides it among the various contributors in the watershed as wasteload (i.e., point source discharge) and load (i.e., nonpoint source) allocations. The TMDL must also account for natural background sources and provide a margin of safety. For nonpoint sources such as accelerated erosion or internal nutrient cycling, it may not be feasible or useful to derive a pounds per day figure. In such cases, a percent reduction in pollutant loading may be proposed. A load analysis may take the form of a phased TMDL, if source reduction or remediation can be better accomplished through an iterative approach.

In Arizona, as in other states, changes in standards or the establishment of site-specific standards are the result of ongoing science-based investigations or changes in toxicity criteria from EPA. Changes in designated uses and standards are part of the surface water standards triennial review process and are subject to public review. Standards are not changed simply to bring the water body into compliance but are based on existing uses and natural conditions. These TMDLs meet or exceed the following EPA Region 9 criteria for approval:

Plan to meet State Surface Water Quality Standards: The TMDLs include a study and a plan for the specific pollutants that must be addressed to ensure that applicable water quality standards are attained.

Describe quantified water quality goals, targets, or endpoints: The TMDLs must establish numeric endpoints for the water quality standards, including beneficial uses to be protected, as a result of implementing the TMDLs. This often requires an interpretation that clearly describes the linkage(s) between factors impacting water quality standards.

Analyze/account for all sources of pollutants: All significant pollutant sources are described, including the magnitude and location of sources.

Identify pollution reduction goals: The TMDL plan includes pollutant reduction targets for all point and nonpoint sources of pollution.

Describe the linkage between water quality endpoints and pollutants of concern: The TMDLs must explain the relationship between the numeric targets and the pollutants of concern. That is, do the recommended pollutant load allocations exceed the loading capacity of the receiving water?

Develop a margin of safety that considers uncertainties, seasonal variations, and critical conditions: The TMDLs must describe how any uncertainties regarding the ability of the plan to meet water quality standards that have been addressed. The plan must consider these issues in its recommended pollution reduction targets.

Provide implementation recommendations for pollutant reduction actions and a monitoring plan: The TMDLs should provide a specific process and schedule for achieving pollutant reduction targets. A monitoring plan should also be included, especially where management actions will be phased in over time and to assess the validity of the pollutant reduction goals.

Include an appropriate level of public involvement in the TMDL process: This is usually met by publishing public notice of the TMDLs in a newspaper of general circulation in the area affected by the study, circulating the TMDLs for public comment, and holding public meeting(s) in local communities. Public involvement must be documented in the state's TMDL submittal to EPA Region 9.

In addition, these TMDLs comply with the public notification requirements of A.R.S. Title 49, Chapter 2, Article 2.1: Publication of these TMDLs in the *Arizona Administrative Register* is required per Arizona Revised Statute, Title 49, Chapter 2, Article 2.1 prior to submission of the TMDLs to EPA. The Department shall:

1. Prepare a draft estimate of the total amount of each pollutant that causes impairment from all sources that may be added to a navigable water while still allowing the navigable water to achieve and maintain applicable surface water quality standards, and provide public notice and an opportunity for comment in a newspaper of general circulation in the affected area;
2. Publish a notice in the *Arizona Administrative Register* (this notice) of the determination of total pollutant loadings that will not result in impairment, a summary of comments received to the initial TMDL public notice, and the Department's responses to the comments;
3. Make reasonable and equitable allocations among TMDL sources, and provide public notice and an opportunity for comment on the draft allocations in a newspaper of general circulation in the affected area;
4. Publish a notice in the *Arizona Administrative Register* of the allocations among contributing sources, along with responses to any comments received on the draft allocations in a newspaper of general circulation.

Federal law only requires the submittal of the pollutant loadings to EPA for approval. However, the Department considers the pollutant loadings and the draft allocations to be integrally related and should be presented together to afford the public a complete understanding of the issues, outcomes and recommendations of the TMDL analysis. For that reason, the Department has combined the loadings and allocations in both the public notice in the local newspaper as well as in this publication in the *Arizona Administrative Register*.

B. Total Maximum Daily Load for Lakeside Lake

Executive Summary

Lakeside Lake is not currently listed as "water quality limited" by the state of Arizona according to the provisions of the Clean Water Act Section 303(d). However, the need for an NPDES permit for discharge of reclaimed water and data collected in two studies from 1998, led the Department to assess the lake as "threatened" for Aquatic and Wildlife warm water designated use standards. The parameters of concern include: low dissolved oxygen (DO), high pH, and violation of the narrative nutrient standard. The lake has experienced very high algal biomass and several fish kills over the years following introduction of reclaimed water in 1990. Reclaimed water originates from Pima County's Roger Road Treatment Plant and is further treated by the City of Tucson for distribution to parks, golf courses, etc.

To verify and quantify respective pollutant loads to Lakeside Lake, the ADEQ Lakes Program hired PBS&J in January 2002 to conduct data analysis and model the lake's responses to storm water and reclaimed water loading. Stakeholders were included in a series of four task force meetings in Tucson to review data and model calibration and to agree on management alternatives to be tested by the model. Modeling alternatives included: baseline condition, a constructed wetland in Atterbury Wash to treat reclaimed water, use of an alternative water source, algaecide or alum treatment, biological nutrient removal (BNR), and a revised aeration system. Due to the need to gather additional

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data, these TMDLs will be phased. Phase I will involve installation of a new aeration system. Phase II may involve additional treatment and/or management alternatives.

Lakeside Lake Watershed Overview

Waterbody: Lakeside Lake (impoundment in Atterbury Wash)
 Waterbody ID: HUC#15050302-0760
 Basin: Santa Cruz
 Drainage: 12 square miles (2/3rds undeveloped)
 Lake Size: 13 surface acres
 Elevation: 2686.4 ASL
 Designated Uses: Aquatic & Wildlife warm water (A&Ww), Fish Consumption (FC), Partial Body Contact (FBC)
 Communities: Tucson
 County: Pima
 Land Ownership: City of Tucson (Parks & Recreation; Tucson Water)
 Land Use: Recreation, Residential, Open Space (gunnery range)
 Potential Sources: Reclaimed water; storm water runoff

Table 1

Applicable Standards	FC	PBC	A&Ww
DO	NA	NA	6.0 mg/L or 90% saturation *
pH	NA	6.5 - 9 SU	6.5 - 9 SU
Narrative Nutrients	NA	**	**

* Within top meter

** R18-11-108(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; ...”

Load Analysis Alternatives

The alternatives modeled that reduced external nutrient loads include: the wetlands, BNR, and use of a low-nutrient alternative water source (in this case, CAP). In-lake treatments did not show a significant or lasting reduction in algal growth or the associated conditions of impairment (DO and pH). However, the proposed new aeration system was shown to significantly alleviate impairment by rapidly cycling algae out of the photic zone, maintaining higher DO and stabilizing pH (Table 1).

Table 2
COMPARISON OF SIMULATION RESULTS OF NORTHERN CELL

Scenario	Without aeration							With aeration (existing aerator except for new aerator alternative)						
	Peak daily average chl a conc (ug/L)	Percentage of days						Peak daily average chl a conc (ug/L)	Percentage of days					
		Daily max pH > 9	Daily min DO in surface layer < 6 mg/L	Daily min DO in surface layer < 4 mg/L	Daily min DO in 4th layer < 4 mg/L	Daily min DO in bottom layer < 1 mg/L	Daily max unionized NH3-N in surface layer > 0.02 mg/L		Daily max pH > 9	Daily min DO in surface layer < 6 mg/L	Daily min DO in surface layer < 4 mg/L	Daily min DO in 4th layer < 4 mg/L	Daily min DO in bottom layer < 1 mg/L	Daily max unionized NH3-N in surface layer > 0.02 mg/L
Baseline	109	28%	9%	0%	94%	100%	100%	65	0%	19%	0%	21%	22%	100%
Reclaimed water with biological nutrient removal	109	33%	9%	0%	94%	100%	100%	65	0%	19%	0%	17%	16%	100%
Wetland in the Wash	109	38%	7%	0%	93%	100%	100%	56	0%	14%	0%	8%	13%	88%
Low nutrient water makeup (CAP water)	90	2%	5%	0%	93%	100%	99%	42	0%	10%	0%	0%	0%	34%
Lake alum treatment	104	45%	9%	0%	93%	100%	100%	66	0%	17%	0%	12%	15%	100%
Lake algaecide treatment	96	29%	8%	0%	94%	100%	100%	64	0%	17%	0%	10%	10%	100%
New aerator								54	0%	6%	0%	0%	0%	100%

Note:
 Period of simulation is from April through September, total of 183 days.

A TMDL normally consists of calculated total loads and proposed load reductions that will meet the relevant water quality standards. Nutrient calculations for Lakeside show reclaimed water contributions far out-weigh storm water inputs. Although use of CAP water would achieve desired TMDL endpoints, this alternative was deemed logistically and economically infeasible.

In order to achieve a significant external nutrient load reduction, it would be necessary to couple at least two of the proposed treatment alternatives tailored specifically to Lakeside Lake. The City of Tucson committed to purchase and install a new and improved aeration system for the lake, as a Phase I TMDL. If the new system accomplishes the goal of meeting water quality standards within one year of installation, Phase II will be unnecessary. If the goal is not reached, additional treatment measures would need to be undertaken by the Fall of 2003. Phase I was designed to verify the water quality concerns, to identify sources of pollution, to determine the water quality goals in the affected subwatershed, and to recommend actions to reduce pollutant loading. Phase I will also include collection of additional data to refine loading as necessary, and to expand on the implementation plan.

Lakeside Lake Load Calculations

Table 3

Loads in kg/year

Scenario	OP		NH3-N		NO2+NO3-N		LDM ¹		LPOM ²	
	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff
Baseline	46.7	9.3	373.5	18.6	140.1	37.2	933.7	1860.0	-	1860.0
	56.0		392.1		177.3		2793.7		1860.0	
Reclaimed water with biological nutrient removal	18.7	9.3	280.1	18.6	93.4	37.2	700.3	1860.0	-	1860.0
	28.0		298.7		130.6		2560.3		1860.0	
Wetland in the Wash	11.7	9.3	46.7	18.6	46.7	37.2	233.4	1860.0	-	1860.0
	21.0		65.3		83.9		2093.4		1860.0	
Low nutrient water makeup (CAP water)	0.5	9.3	0.5	18.6	9.3	37.2	93.4	1860.0	-	1860.0
	9.8		19.1		46.5		1953.4		1860.0	
Lake alum treatment	46.7	9.3	373.5	18.6	140.1	37.2	933.7	1860.0	-	1860.0
	56.0		392.1		177.3		2793.7		1860.0	

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Lake algaecide treatment	46.7 56.0	9.3	373.5 392.1	18.6	140.1 177.3	37.2	933.7 2793.7	1860.0	-	1860.0
New aerator	46.7 56.0	9.3	373.5 392.1	18.6	140.1 177.3	37.2	933.7 2793.7	1860.0	-	1860.0

Loads in lbs/day

Scenario	OP		NH3-N		NO2+NO3-N		LDM ¹		LPOM ²	
	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff	Makeup	Runoff
Baseline	0.28	0.06	2.25	0.11	0.84	0.22	5.63	11.21	-	11.21
		0.34		2.36		1.07		16.84		11.21
Reclaimed water with biological nutrient removal	0.11	0.06	1.69	0.11	0.56	0.22	4.22	11.21	-	11.21
		0.17		1.80		0.79		15.43		11.21
Wetland in the Wash	0.07	0.06	0.28	0.11	0.28	0.22	1.41	11.21	-	11.21
		0.13		0.39		0.51		12.62		11.21
Low nutrient water makeup (CAP water)	0.00	0.06	0.00	0.11	0.06	0.22	0.56	11.21	-	11.21
		0.06		0.11		0.28		11.77		11.21
Lake alum treatment	0.28	0.06	2.25	0.11	0.84	0.22	5.63	11.21	-	11.21
		0.34		2.36		1.07		16.84		11.21
Lake algaecide treatment	0.28	0.06	2.25	0.11	0.84	0.22	5.63	11.21	-	11.21
		0.34		2.36		1.07		16.84		11.21
New aerator	0.28	0.06	2.25	0.11	0.84	0.22	5.63	11.21	-	11.21
		0.34		2.36		1.07		16.84		11.21

¹ LDOM Labile dissolved organic matter.

² LPOM Labile particulate organic matter.

³ Concentrations are shown in Table 5-4.

⁴ Annual volume of makeup water is 37.8 ac-ft.

⁵ Annual volume of runoff is 150.6 ac-ft.

⁶ Italicized value is sum of loads in makeup water an runoff.

Phase I TMDL Expectations:

Chlorophyll: With the new aeration system, chlorophyll concentration is expected to moderate from increased vertical mixing.

The model predicts that peak chlorophyll will not exceed 60 ug/L, a 44% reduction from the simulated peak value without aeration. It is possible that there may be a favorable shift in algal species, though it is also likely the lake will remain “hyper-eutrophic”. There is no numeric water quality standard for chlorophyll, just the narrative standard interpretation of “no excess algae or aquatic plants”.

pH: The anticipated impact on pH is to level out the spikes that result from the loss of CO₂ from the system when respiration out-paces production.

The model predicts that pH will be less than 9.0 at all depths/times: 100% compliance with surface water quality standard.

DO: For dissolved oxygen (DO), the result is a direct increase within both the photic zone where algae are growing (even at night when they are respiring) and at lower depths, where algae are dying (and consuming oxygen as they decompose).

The model predicts that DO will be maintained at a minimum of 4 mg/L at all depths and at 6+ mg/L above the thermocline: 100% compliance with the surface water quality standard.

Ammonia: High levels of ammonia (the preferred food source for algae) will, under well oxygenated conditions, be taken up quickly or converted to nitrate.

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The model predicts lower levels of ammonia (particularly un-ionized ammonia) that are potentially toxic to fish: compliance with surface water quality standard will be assessed based on water temperature and pH data.

Phosphorus: Increased and sustained aeration will lead to less reduced forms of phosphorus, and in particular, to less phosphorus being released from sediments. Decayed algae will form a complex with an oxidized microzone of iron-containing molecules which effectively seals off nutrients from becoming available (Walker, 1998).

The model does not predict a numeric reduction in phosphorus per se. However, monitoring for dissolved oxygen, available phosphate, and biological oxygen demand at the sediment-water interface will demonstrate the projected reduction in available phosphorus.

Phase I TMDL Implementation:

The new aeration system was installed at Lakeside during the week of June 24, 2002. The City of Tucson began monitoring and sampling at the lake in July 2002. Monitoring will continue until the end of the 2003 summer, at which time TMDL status will be re-evaluated. If at that time the lake is still "impaired", further modeling and alternative analysis will be required.

Public Participation Component:

Public participation was encouraged and received throughout the development of this Phase I TMDL. ADEQ and its contractor established a task force early in the analysis and modeling process. The group included representatives from: City of Tucson Parks & Recreation, City of Tucson Water, City of Tucson Transportation & Stormwater, City of Tucson Environmental Management, Pima County Wastewater and Environmental departments, Arizona Game and Fish Department, University of Arizona Environmental Research Center, and Aquatic Consulting & Technology Inc.

The Load Analysis Report and preliminary Draft TMDL Report were made available to the Task Force in early July 2002. ADEQ responded to stakeholder comments by early August 2002. Public notice of the availability of the draft document was posted in a newspaper of general circulation, the Tucson Daily Star, on August 12, 2002. Later that week, a copy of the document was posted on the ADEQ web site <http://www.adeq.state.az.us> and was available for review at the ADEQ library and the Tucson Public Library.

A public meeting was held in on August 22, 2002 at the Southern Regional Office of ADEQ in Tucson, AZ. Staff from ADEQ and its contractor were present. The Department received no comments pursuant to the public meeting. This publication is being entered in the Arizona Administrative Record as required per Arizona Revised Statute, Title 49, Chapter 2, Article 2.1.

4. The name and address of agency personnel with whom persons may communicate regarding the public information:

Name: Susan Fitch
Address: Arizona Department of Environmental Quality
1110 W. Washington
Phoenix, AZ 85007
Telephone: (602) 771-4541 (in Arizona: 1-800-234-5677; ask for four-digit extension)
Fax: (602) 771-4528
E-mail: fitch.susan@ev.state.az.us

Copies of the draft TMDLs may be obtained from the Department by contacting the numbers above. The draft TMDLs may also be downloaded from the Department's web site at: <http://www.adeq.state.az.us/environ/water/assess/download/status.html>.

5. The time during which the agency will accept written comments and the time and place where oral comments may be made:

This notice is for a period of 45 days commencing on the date of publication in the *Administrative Register*. There are no oral proceedings scheduled for this TMDL pursuant to this notice.

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DEPARTMENT OF ENVIRONMENTAL QUALITY

1. **A.R.S. Title and its heading:** 49, The Environment
A.R.S. Chapter and its heading: 2, Water Quality Control
A.R.S. Article and its heading: 2.1, Total Maximum Daily Loads
Section: A.R.S. § 49-234, Total maximum daily loads; implementation plans

2. **The public information relating to the listed statute:**

Pursuant to A.R.S. § 49-234, the Arizona Department of Environmental Quality (Department) is required to develop a total maximum daily load (TMDL) for navigable waters that are listed as impaired. The purpose of this notice is to publish the Department's determinations of total pollutant loadings for TMDLs in the Boulder Creek Watershed that the Department intends to submit to the Regional Administrator for Region 9, U.S. Environmental Protection Agency ("EPA") for approval.

The Department previously provided public notice and an opportunity for public comment on the "Draft Boulder Creek TMDL for Arsenic, Beryllium, Copper, Lead, Manganese, and Zinc" in *The Daily Courier*, a newspaper of general circulation in the affected area, on July 12, 2002. The Department received written comments from Phelps Dodge Bagdad, Inc., the EPA, Region 9, and Arizona Game and Fish Department on the TMDL during the public notice period. The Department has included a summary of the comments and the Department's responses, in this notice. The purpose of this notice is to satisfy A.R.S. §§ 49-234(D) and 49-234(E), which require the Department to publish in the *Arizona Administrative Register* the determination of total pollutant loadings that will not result in impairment and the proposed allocations among the contributing sources that are sufficient to achieve the total pollutant loadings.

3. **Total Maximum Daily Loads (TMDLs)**

A. Total Maximum Daily Load (TMDL) Process

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Analyze/account for all sources of pollutants: All significant pollutant sources are described, including the magnitude and location of sources.

Identify pollution reduction goals: The TMDL plan includes pollutant reduction targets for all point and nonpoint sources of pollution.

Describe the linkage between water quality endpoints and pollutants of concern: The TMDLs must explain the relationship between the numeric targets and the pollutants of concern. That is, do the recommended pollutant load allocations exceed the loading capacity of the receiving water?

Develop margin of safety that considers uncertainties, seasonal variations, and critical conditions: The TMDLs must describe how any uncertainties regarding the ability of the plan to meet water quality standards that have been addressed. The plan must consider these issues in its recommended pollution reduction targets.

Provide implementation recommendations for pollutant reduction actions and a monitoring plan: The TMDLs should provide a specific process and schedule for achieving pollutant reduction targets. A monitoring plan should also be included, especially where management actions will be phased in over time and to assess the validity of the pollutant reduction goals.

Include an appropriate level of public involvement in the TMDL process: This is usually met by publishing public notice of the TMDLs in a newspaper of general circulation in the area affected by the study, circulating the TMDLs for public comment, and holding public meetings in local communities. Public involvement must be documented in the state's TMDL submittal to EPA Region 9.

In addition, these TMDLs comply with the public notification requirements of A.R.S. Title 49, Chapter 2, Article 2.1: Publication of these TMDLs in the *Arizona Administrative Register* is required per Arizona Revised Statute, Title 49, Chapter 2, Article 2.1 prior to submission of the TMDL to EPA. The Department shall:

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B. Total Maximum Daily Load for Boulder Creek

Executive Summary

Boulder Creek, located near Bagdad, AZ, in west central Yavapai County, appears on the Arizona Department of Environmental Quality's 1998 List of Water Quality Limited Waters, 303(d) list, from Wilder Creek to Burro Creek for exceedances of surface water quality standards for arsenic, beryllium, copper, lead, manganese, and zinc. Specific water quality standards for these parameters are listed in Title 18, Chapter 11 of the Arizona Administrative Code.

The data used to determine impairment for the 303(d) listing were collected on October 22, 1992, in support of the goals of other programs. These results were insufficient to isolate sources or to characterize the impacts of weather, physical conditions or seasonal variation on the stream water quality. As part of this project, the ADEQ TMDL Program collected data specific to the goals of source identification and TMDL calculation. Water quality samples were collected on a monthly basis from October 2000 until August 2001 at 11 sites to systematically monitor conditions along the listed reach. Sites were established at the beginning and end of the reach; upstream and downstream of potential non point sources; at potential point sources; and at several other accessible monitoring locations.

The sources of pollutants are three tailings piles, the upper tailings pile, the middle tailings pile, and the lower tailings pile, and an adit discharge from the abandoned Hillside Mine. The tailings piles are located on land owned by three different entities: Bureau of Land Management (BLM), private, and state of Arizona, respectively. In October 1999, BLM hired a contractor to conduct a site characterization of the tailings piles in preparation for remediation efforts. BLM and its contractors drafted a remediation/reclamation plan for the upper and middle tailings piles. In early 2001, the U.S Environmental Protection Agency (EPA) became involved in remediation by offering financial assistance and by offering to manage the project under the Comprehensive Environmental Response, Compensation and Liability Act. Currently, the Hillside Mine is not on the National Priorities List (NPL), and its non-NPL status is as a "removal only" site. In late summer 2001, EPA entered discussions with the private landowner to review the landowner's proposal to reprocess and remediate the upper and middle tailings piles. Since then, the owners of the middle tailings pile have rescinded their offer to reprocess the tailings piles and are discussing reclamation possibilities with EPA. BLM

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is moving forward on their plans to remediate the upper tailings pile. The Arizona Department of Environmental Quality (ADEQ) is assisting the Arizona State Land Department in applying for a federal 319(h) grant to develop and start a reclamation project for the lower tailings pile.

Boulder Creek Watershed Overview

Waterbody: Boulder Creek Watershed
 Drainage: 138 square miles
 Designated Uses: Aquatic & Wildlife, warm water; Fish consumption; Full body contact; Agriculture, irrigation; Agriculture, livestock watering
 Communities: Bagdad
 County: Yavapai
 Land Ownership: State trust, private, BLM
 Land Use: Open rangeland, ranching, mining
 Principal Geology: Pre-Cambrian to Tertiary igneous and metamorphic rocks
 Potential Sources: Tailings piles and adit discharge from the abandoned Hillside Mine
 Public Participation: Through stakeholder and public meetings, the internet, and public noticing procedures as required by Arizona Revised Statutes § 49-231, which includes a 30-day notice in the local newspaper (July 12, 2002) and a 45-day notice in the *Arizona Administrative Register*

Boulder Creek TMDL Calculations and Values

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. It can be expressed in terms of mass per time or by other appropriate measures. A TMDL is comprised of the sum of individual wasteload allocations (WLA) for point sources, and load allocations (LA) for non-point sources and natural background levels. The Boulder Creek TMDLs contain a 5% explicit margin of safety (MOS) that accounts for the differences between modeled and monitored data and a 5% implicit MOS built into the endpoints to account for any error introduced in sampling or analysis. Conceptually, the TMDL definition is denoted by the equation:

$$TMDL = \sum WLA_s + \sum LA_s + MOS$$

The TMDLs for Boulder Creek identify the total amount of pollutant that can be assimilated by the receiving system while still achieving water quality standards.

Existing Loadings from Natural Background (g/day)

	As	Cu	Zn
Upstream Boundary Conditions	7.89	23.68	31.58
Butte Creek Watershed	1.66	2.49	6.65

Existing Loadings from Adit Discharge (g/day)

As	Cu	Zn
164.17	0.40	57.59

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Existing Loadings from Tailings Piles (g/day)

	As	Cu	Zn
Upper Tailings Pile	43.17	61.43	605.80
Middle Tailings Pile	<1	<1	2.80
Lower Tailings Pile	<1	<1	217.13

WLAs (g/day)

	As	Cu	Zn	Percent Reduction from Existing Loadings
Adit Discharge	32.83	0.08	11.52	80%

Load Allocations (g/day)

	As	Cu	Zn	Percent Reduction from Existing Loadings
Upper Tailings Pile	9.07	12.90	127.22	79%
Middle Tailings Pile	<1	<1	1.45	52%
Lower Tailings Pile	<1	<1	84.98	40%
Natural Background	9.56	26.18	38.22	0%

Boulder Creek TMDLs (g/day)

	As	Cu	Zn
LA	18.63	39.08	251.87
WLA	32.83	0.08	11.52
MOS	2.57	1.96	13.17
TMDL	54.03	41.12	276.56

TMDL Implementation

In September 1999, AMEC Earth & Environmental (Formerly AGRA Earth & Environmental, Inc.), in cooperation with BLM, conducted a site characterization of the mine tailings and adit seep (AGRA, 2000). BLM used the data obtained from the site characterization to prepare an Engineering Evaluation/Cost Analysis (EE/CA) of the site (BLM, 2000). Due to the proximity of the middle tailings pile to the upper tailings pile, BLM included the middle tailings pile in their initial remediation plans. The lower tailings pile was not considered because of its accessibility issues. The EE/CA provided an alternatives analysis for remedial actions at the site. The recommendation was to consolidate the upper and lower tailings piles. The tailings would be moved out of the 100 year flood plain and runoff/runoff controls would be placed on the capped surface (BLM, 2000). An oxidation pond would be constructed to address the adit discharge.

During a meeting in February 2001, representatives from EPA's Emergency Response Office clarified their intent to assist BLM with the project. EPA was willing to provide financial assistance, manage the project under CERCLA, if necessary, and take enforcement action against the private owners of the middle tailings pile. In March 2001, AMEC submitted an Engineering Analysis and Design to BLM. This report outlined the engineering analysis, proposed design layout of the consolidated tailings piles, and preliminary construction plans (AMEC, 2001a). During a meet-

ing in May 2001, general design/concept data gaps were identified. AMEC agreed to conduct some follow-up work to address the data gaps.

AMEC submitted an updated proposal in September 2001. In the updated proposal, the tailings piles would be left in place, regraded, and capped (AMEC, 2001b). Concerns about the strength characteristics and total volume of the combined tailings prompted the change. Also at this time, KFX submitted to EPA a mining and remediation proposal for the middle tailings pile. In this plan, KFX would excavate the tailings, process them, redeposit the materials, and cap them. The processing would be done in a 500 ton-per-day closed loop system. EPA addressed their proposal and stipulated that EPA would monitor the process under CERCLA. EPA also stipulated that KFX would have to enter a three party agreement with EPA and BLM, post adequate financial surety, and complete the process in 15 months. BLM's project was put on hold until the situation with KFX could be resolved. KFX has since rescinded the proposal to reprocess the tailings piles and is discussing reclamation possibilities with EPA (EPA, 2002). There is no estimated time-frame for any remedial action at the middle tailings pile. BLM is moving forward on their plans to remediate the upper tailing pile (BLM, 2002). The cultural survey is supposed to be started late spring or early summer 2002. Actual construction is not expected to start until spring 2003.

ADEQ is assisting the State Land Department in applying for a section 319 Grant to develop and begin a reclamation project for the lower tailings pile. Due to the site accessibility issues and cost limitations, the best implementation strategy will likely be to regrade and cap the tailings pile. Runon/runoff controls would have to be constructed to prevent degradation of the capping material and subsequent erosion of the underlying tailings piles. Institutional controls, such as fencing or barricades, would need to be put in place to prevent individuals from destroying the capping materials.

An alternative for the adit discharge is an onsite reclamation pond. This would more than likely involve an open pit lined with crushed limestone or other material to induce precipitation of metals and increase pH. The pond would have to undergo periodic maintenance to remove precipitated metals.

Public Participation Component

Public participation was encouraged and received throughout the development of this TMDL. A total of six meetings were held during this process. Involved parties include EPA, BLM, US Army Corps of Engineers, ADEQ, Arizona State Land Department, Arizona Game and Fish Department, KFX, Phelps Dodge, and representatives from contractors involved with all levels of the projects mentioned previously. The draft TMDL report was made available for a 30-day public comment period starting July 12, 2002. Public notice of the availability of the draft document was made through a posting in a newspaper of general circulation, *The Daily Courier*; by e-mail notifications; phone calls; and web page postings. The draft Boulder Creek TMDL was presented in a public meeting in Bagdad, AZ, on July 23, 2002.

4. The following are comments submitted by Phelps Dodge Bagdad, Inc. (PDBI):

COMMENT: PDBI requests that ADEQ recognize in the TMDL, as well as in the final 303(d) list, that the listed segment for both copper and zinc is limited to no more than the approximately one mile segment from the Hillside Mine upper tailing impoundment to TMDL monitoring point G.

RESPONSE: Sample results indicate that there were exceedances for the zinc and copper standards for Aquatic & Wildlife, warmwater (acute) in the segment from Wilder Creek to Butte Creek. There were no exceedances of the zinc or copper standards below Butte Creek. ADEQ proposes to delist Boulder Creek for copper and zinc below the confluence with Butte Creek.

COMMENT: The last two sentences in paragraph two of the executive summary should be revised to more accurately reflect the sampling results for copper and zinc.

RESPONSE: See previous response.

COMMENT: The last sentence in section 3.1, paragraph two, should be revised as follows: Arsenic will remain on the list for the segment from Wilder Creek to Copper Creek. Copper will remain on the list from Wilder Creek to below the upper tailing pile. Zinc will remain on the list from Wilder Creek to TMDL monitoring point G.

RESPONSE See previous response.

COMMENT: Because the draft TMDL only applies to the critical low-flow condition identified in the draft TMDL, ADEQ should clarify that wasteload allocations for industrial storm water discharges are unnecessary and that such discharges are otherwise consistent with the draft TMDL.

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RESPONSE: The report has been clarified with respect to stormwater discharges.

COMMENT: The first sentence in paragraph two of the executive summary should be revised to change the reference to "water quality violations" and to use "exceedances" instead.

RESPONSE: ADEQ agrees with this comment and has changed the wording to correspond to wording in Arizona's Impaired Waters Identification Rule.

The following are comments submitted by the U.S. Environmental Protection Agency (EPA):

COMMENT: The *Draft TMDL* proposes to delist for Beryllium, Lead and Manganese for all listed segments of Boulder Creek and to delist for arsenic, copper and zinc downstream of confluence with Copper Creek.

The data provided do not definitively support the proposed delistings. In several instances, the water chemistry results give a concentration at the reporting or method detection limit; however this value is above the applicable water quality standard. Such indeterminate results are not sufficient to support delisting for beryllium and lead, copper. For manganese, the water chemistry results show three exceedances during the sampling time period (one year). In accordance with AZ Impaired Waters Rule (sec. 602(a)(4)), toxic pollutants will be listed if acute standards are exceeded more than once in any three year period; therefore there is insufficient data to support delisting manganese. Additional rationale or clarification is required before EPA will support these delistings.

RESPONSE: In this TMDL report, beryllium is the only parameter that has results that show less than a detection limit where the detection limit is higher than the water quality standard. In accordance with the Arizona Impaired Waters Identification Rule (A.A.C. R18-11-603(A)), "When the sample value is less than or equal to the laboratory detection limit but the detection limit is greater than the surface water quality standard, (the Department) shall not use the result for impaired water identifications or TMDL decisions." This report adheres to this rule. The delist section of the report has been expanded to include a table which demonstrates that beryllium exceeds water quality standards only 3% of the time in the upper segment (Wilder Creek to Butte Creek) and that there are no exceedances in the middle and lower segments (Butte Creek to Copper Creek and Copper Creek to Burro Creek). In accordance with the new Impaired Waters Identification Rule, one exceedance in 48 samples is insufficient for listing. In addition, it should be noted that Arizona's proposed water quality standards will raise the beryllium standard to 1130 ug/l (total) for fish consumption and this will remain the most stringent standard for the designated uses of Boulder Creek. When this change occurs, the less detection limit issue will be moot as "<5" will be two orders of magnitude less than the applicable standard of 1130 ug/l. ADEQ proposes to delist beryllium from the entire reach.

With respect to manganese exceedances, Arizona does not have Aquatic & Wildlife warm water standards, therefore, the two exceedances in three years threshold quoted by the commentor is not applicable. In accordance with the new Impaired Waters Identification Rule, in the upper segment there were three exceedances in 48 samples; this is insufficient for listing and represents a 6% exceedance rate. In the middle and lower segments there are were exceedances. ADEQ proposes to delist the entire stretch for manganese.

For lead, there is an aquatic and wildlife acute standard, however, the table shows no exceedances for lead in the listed reach. All three segments show water quality standards are being met.

COMMENT: The *Draft TMDL* discusses the Numeric Targets in section 2 in relation to the applicable water quality standards. Some information needs to be rectified.

EPA requests more clear language to designate the specific numeric targets for these TMDLs. Table 2-1 presents the range of water quality standards but it does not clarify the standard selected for each metal. The units of measure should be ug/L. The maximum hardness value should be 400 mg/L.

RESPONSE: ADEQ appreciates EPA pointing our several errors that were introduced during editing. These have been corrected in Table 2-1. This table is a graphical representation of use designations and the range of water quality standards, based on the appropriate range of hardness values, for each metal for which the stream is listed.

The discussion of endpoints can be found in section 4.5 of the original and revised reports. An average hardness value of 225 mg/l was used in this section and was derived from the actual water quality data collected on the impaired reach during this investigation. No changes have been made to this section.

COMMENT: The *Draft TMDL*, in section 4.5.3, defines the loading capacity for Boulder Creek during critical flow conditions of 0.75 cfs. One loading capacity for each metal (As, Cu, Zn) is presented in Table 4-1.

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EPA urges ADEQ staff to revise this section to improve explanation of loading capacity and its application to the entire creek. Does the single value (for each metal) presented in Table 4-1 represent the loading capacity for the entire creek? Why was the critical condition defined at 0.75 cfs instead of some other stream flow rate? How does the TMDL address water conditions that vary with hardness and the corresponding loading capacity for copper and zinc? Additional information is required for this section. The TMDL should also give specific information (and equations) for converting the TMDL endpoint into the loading capacity. Whereas the *Draft TMDL* describes loading from natural background sources, it is unclear how these inputs are interpreted with respect to the loading capacity and allocations.

RESPONSE: The critical condition of 0.75 cfs was determined through use of the model which identified those conditions that led to water quality standards exceedances. It is during the low-flow that the concentrations are at their highest, and it is also when the adit accounts for a greatest portion of the in-stream flows. Model runs were made to determine whether there is a high-flow critical condition. Concentrations never exceeded nor came close to the standards in any of the higher than critical flow situations. Sample results showed that higher flows act to dilute the arsenic, copper, and zinc concentrations.

The Boulder Creek TMDLs were set to meet water quality standards at the critical condition. The TMDLs apply throughout the listed reach, and they include the appropriate load from natural background. The TMDLs become most limiting just downstream of the tailings piles, where accumulation from sources leads to the highest in-stream concentrations. The model was also used to predict in-stream concentrations that would occur should certain reductions be made throughout the watershed during the critical condition.

Because the Boulder Creek TMDLs were derived using a chemical speciation model, varying water conditions, such as hardness, and hardness-based water quality standards were considered through the modeling trials. The model calculates the concentration of calcium and magnesium ions for each segment, and then uses these concentrations to calculate the hardness for each segment. On a segment-by-segment basis, daily averaged hardness values were computed and input into hardness-based water quality standards equations so that comparisons with actual standards could be made at each of the 1000 plus cells along Boulder Creek. The loading capacity was calculated from the TMDL endpoint by multiplying the endpoint concentration value by the critical flow condition and then using necessary conversions to arrive at a daily loading.

Additional discussion and tables supporting calculation of endpoints, loading capacities, TMDLs, and load allocations have been added to the report.

COMMENT: The *Draft TMDL* needs some re-organization of information presented in sections 3 and 4. Information on existing loadings in watershed (section 4.6) should be moved to source assessment (section 3). A final summary table of inputs from various sources should be included (in section 3) for comparison with loading capacity. Information in section 4 should be rearranged to explain the TMDL and loading capacity prior to the wasteload and load allocations.

RESPONSE: ADEQ appreciates the suggestions and many of them were incorporated into the revised report. There was a final summary table of inputs in the original report so this was not changed.

COMMENT: The *Draft TMDL* implementation section describes agencies and private groups involved in various projects to address improved water quality conditions. Specific references are made to past events and/or reports. Are there any special investigations or additional monitoring studies that are worth proposing?

The implementation section should provide milestones and completion dates for future projects. Assuming that discharges from Upper Tailing pile and adit are of biggest concern, EPA recommends more elaborate description of corrective actions, methodologies and procedures that might be applied.

RESPONSE: To date, the Bureau of Land Management is the lead agency for remediation of the upper tailings pile near the Hillside Mine. In 2000, an EE/CA with numerous alternatives was prepared. As stated in the TMDL report, these remediation efforts are moving forward. A cultural survey was planned for late spring or early summer 2002. Construction was estimated to start no earlier than spring 2003. ADEQ will conduct effectiveness monitoring on the project but the timing of it will depend on the project progression. The specific activities and time-frames supporting effectiveness monitoring will be described as necessary in a Sampling and Analysis Plan that will be developed by the Department when follow up sampling is scheduled. At this time, no additional special investigations or monitoring studies are planned on the upper reach until after BLM has completed their project. The state will continue to work with the owner of the middle tailings pile and the State Land Department (owner of the lower tailings pile) to evaluate possible remediation strategies and funding sources.

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Arizona anticipates receiving the delegation of the National Pollutant Discharge Elimination System permit program in fall, 2002. Upon delegation, ADEQ can require the owner of the middle tailings pile to apply for permits for the adit discharge to Boulder Creek and any treatment processes necessary to bring the discharge into compliance with water quality standards. Likewise, certain aspects of abandoned mining operations may fall under the regulatory requirements of the NPDES multi-sector stormwater program. Upon receiving delegation of the program, the state can investigate additional regulatory requirements. Prior to delegation of the program to the state, EPA is responsible for these determinations.

5. The time during which the agency will accept written comments and the time and place where oral comments may be made:

There is no public comment period associated with this notice; the Department previously provided an opportunity for comment on the proposed TMDLs.

6. The name and address of agency personnel with whom persons may communicate regarding the public information:

Name: Chris Notgrass
Address: Arizona Department of Environmental Quality
1110 W. Washington
Phoenix, AZ 85007
Telephone: (602) 771-4247 (in Arizona: 1-800-234-5677; ask for four-digit extension)
E-mail: acn@ev.state.az.us

Copies of the revised draft TMDL may be obtained from the Department by contacting the numbers above. The revised draft TMDL may also be downloaded from the Department's web site at: <http://www.adeq.state.az.us/environ/water/assess/download/status.html>