

# Oklahoma Water Quality Standards Public Stakeholder Meeting

Oklahoma Water Resources Board  
October 10, 2017

# **Proposed Site-Specific Copper Criteria for the City of Idabel Discharge to Mud Creek**

# Aquatic Life Criteria

- Oklahoma's WQS includes acute and chronic criteria for the protection of fish and wildlife from toxic substances
  - OAC 785:45, Appendix G, Table 2
- Copper
  - Surface water sources
  - Bioavailability of copper depends on water chemistry
  - Alkalinity, pH, DOC, TSS, and hardness (CaCO<sub>3</sub>)
- Statewide copper criteria are expressed as equations to account for ambient water hardness effects on toxicity

		Acute	Chronic
Copper	7440508	$e(0.9422[\ln(\text{hardness})] - 1.3844)$	$e(0.8545[\ln(\text{hardness})] - 1.386)$

# Site-Specific Criteria

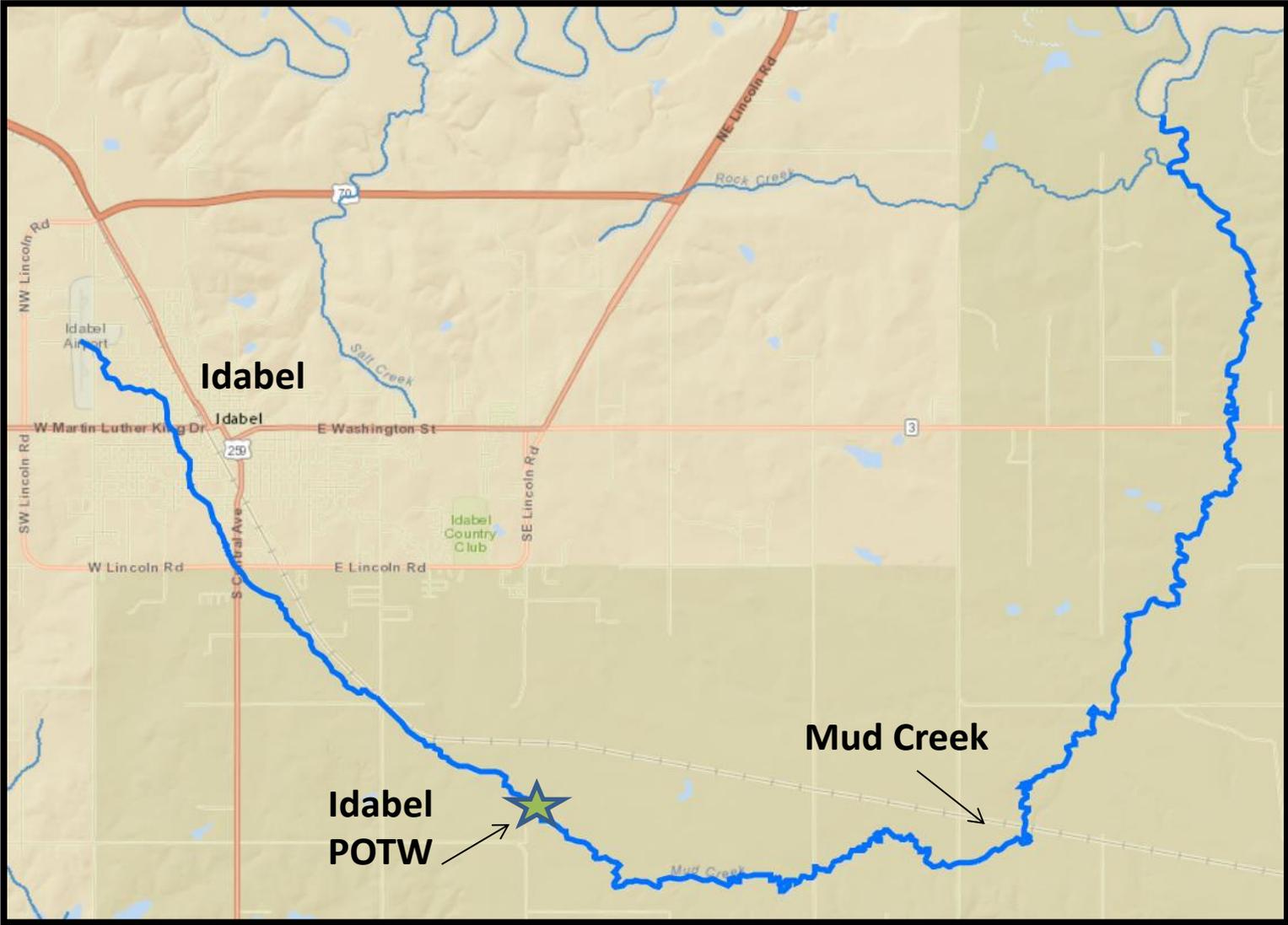
- **OAC 785:45, Appendix E**
  - Requirements, procedures, options
- **Water Effects Ratio (WER)**
  - Available to permittee upon OWRB workplan approval
  - Adjustment factor which accounts for site-specific water chemistry effects on metals toxicity
  - Difference between the toxicity of metal in lab water and site water
  - OWRB’s “Guidance for Developing Site Specific Criteria for Metals” (2003) and EPA’s “Streamlined Water-Effect Ratio Procedure for Discharges of Copper” (2001)

# Idabel

- **City of Idabel**
  - 7,010 (2010 U.S. Census)
  - McCurtain County, SE Oklahoma
- **POTW**
  - Design flow is 2.56 cfs, 1 cfs background
  - Critical dilution is 100% effluent
  - Mud Creek (410200) mean hardness of 32 mg/L listed in OAC 785:46, Appendix E
- **Problem**
  - Not achieving permit copper limits
  - WER workplan approved by OWRB 07/07/15



# Mud Creek



# Study Requirements

- Sample collection
  - Two events, min 1 month apart, stable flow
  - Upstream and effluent
  - Plant performance average or better
- Sample analysis
  - Effluent /upstream combined at permit dilution
  - Copper, hardness, alkalinity, pH, DOC, TSS
- Toxicity testing
  - *Ceriodaphnia dubia* or *Daphnia magna*
  - 48-hr LC50, spiked with metal salts
  - Side-by-side, lab and site water

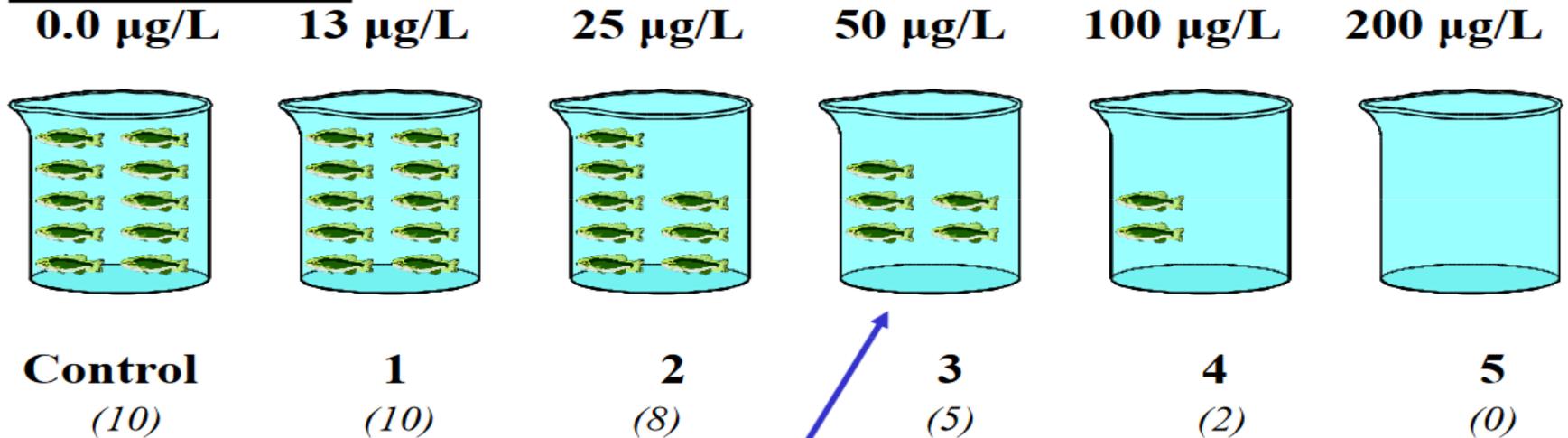


*Ceriodaphnia dubia*

# Idabel WER Design

- Study conducted over a five month period from May to September 2016
- For each WER test, four grabs collected over 6hrs, then composited
- *C. dubia*, copper sulfate spiking agent
- LC50's of lab water, site water, and SMAV are compared
- The final WER (fWER) is the geo mean of individual WERs for each date

## Concentration:



# Toxicity Testing Results

City of Idabel  
3040-15-050  
WER - 1  
7/26/2016

City of Idabel  
3040-15-050  
WER - 2  
9/27/2016

Effluent Hardness (µg/L) 77000  
Lab water Hardness (µg/L) 98000

Effluent Hardness (µg/L) 69000  
Lab water Hardness (µg/L) 89000

Total Copper SMAV (µg/L) 24  
Normalized SMAV 23.5

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Normalized SMAV 21.5

D. Copper SMAV (µg/L) 22.11  
Normalized SMAV 21.7

D. Copper SMAV (µg/L) 22.11  
Normalized SMAV 19.8

## Total Copper - Ceriodaphnia

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	LC50 (µg/L)	Normalized LC50
Effluent	128	160.7
Lab Water	7.25	7.25

	LC50 (µg/L)	Normalized LC50
Effluent	125	158.9
Lab Water	7.17	7.17

\*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)<sup>0.9422</sup>

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## Dissolved Copper - Ceriodaphnia

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	LC50 (µg/L)	Normalized LC50
Effluent	105	131.8
Lab Water	6.66	6.66

	LC50 (µg/L)	Normalized LC50
Effluent	108	137.3
Lab Water	6.62	6.62

\*Normalized LC50 = SWM LC50 x (lab hdns/swm hdns)<sup>0.9422</sup>

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# WER & fWER Equations

## WER

Lesser of Lab Water LC50 or SMAV/Site Water LC50

## fWER

$$\exp [\sum \ln(\text{WER}_i)/n]$$

WER	OWRB WER
WER 1	0.165
WER 2	0.144
Final WER (fWER)	0.154

# Dissolved Translator Results

- **Dissolved translator (f)**
  - geometric mean of the (D:T) ratio of 10 paired analyses
  - used in conjunction with the fWER to derive a criterion translator (T)
  - **fWER = 0.1541, (f) = 0.75**

**Copper T = fWER x f = 0.1160**

Table 12. Dissolved Translator

	Copper
	(Dissolved/Total)
5/3/2016	0.55
6/27/2016	0.82
6/28/2016	0.69
7/6/2016	0.79
7/7/2016	1.03
7/20/2016	0.85
7/21/2016	0.85
7/26/2016	0.75
7/27/2016	0.75
7/28/2016	0.65
9/27/2016	0.66
<b>Geomean (f) (OWRB)</b>	<b>0.75</b>

# Proposed Criteria

## Acute

$$S_{ast} = C_{asd} / (fxfWER_d)$$

acute site-specific total criterion = acute statewide dissolved criterion  
/(dissolved to total fraction x final dissolved water effect ratio)

## Chronic

$$S_{cst} = C_{csd} / (fxfWER_d)$$

	Current Copper Criteria (@ 32 mg/L hardness)*		WER Adjusted Criteria	
Parameter	Acute (µg/L)	Chronic (µg/L)	Acute (µg/L)	Chronic (µg/L)
<b>Copper</b>	<b>6.56</b>	<b>4.83</b>	<b>54.28</b>	<b>39.97</b>

\*Calculated using the statewide hardness dependent criteria equations in OAC 785:45, Appendix G

# Rulemaking Steps

- **Included in 2018 Rulemaking (~ 1 yr)**
- **December**
  - published in Oklahoma Register
- **January**
  - public hearing
- **February**
  - OWRB consideration
- **Legislature and Governor (State Law)**
- **EPA review (effective for CWA programs)**

# Stakeholder Meetings

- Opportunity for public feedback & discussion
- Actions planned for the 2017-18 Rulemaking

## Today's Meeting

- Discussion of Methyl-Mercury
- Copper site-specific criteria for discharge to Mud Creek (City of Idabel)
- Groundwater Quality Standards

# Rulemaking Schedule 2017-2018

Task	Date
Public stakeholder meetings	Sept. 7 <sup>th</sup> , Oct. 10 <sup>th</sup> , & Oct 25 <sup>th</sup>
Governor & Secretary of Energy & Environment Review	November 8, 2017
Draft proposed rules available for public comment	December 1, 2017
OWRB Public Hearing & comment period closes	January 16, 2018
OWRB meeting & rule consideration	February 20, 2018
Legislative & Gubernatorial review	Spring 2018
Rules become state law	September 2018
EPA review & approval	February – March 2019

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