

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

**Oklahoma Water Resources Board
October 25, 2017**

Aquatic Life Criteria

- Oklahoma's WQS includes acute and chronic criteria for the protection of fish and wildlife from toxic substances
- Copper
 - Bioavailability depends on water chemistry
 - Alkalinity, pH, DOC, TSS, and hardness
- Statewide copper criteria are expressed as equations to account for ambient water hardness effects on toxicity

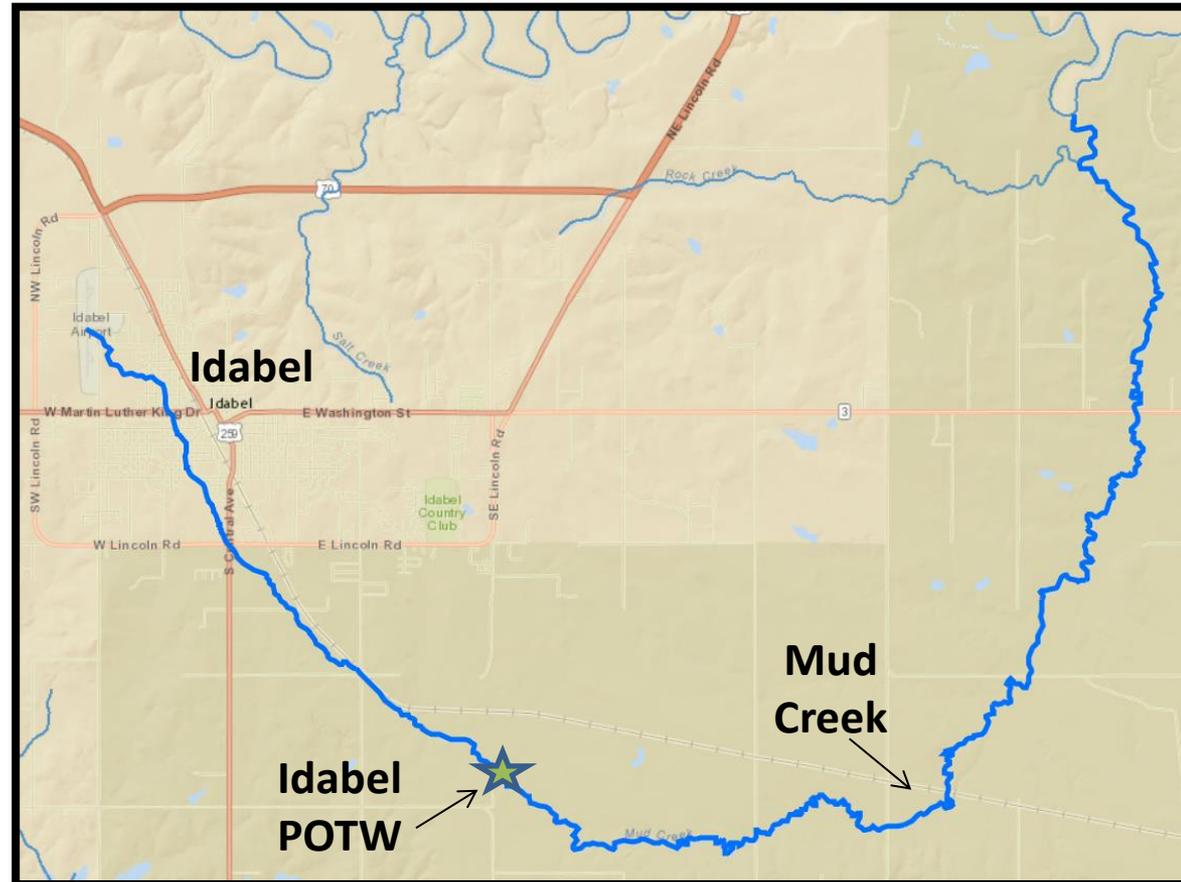
		Acute	Chronic
Copper	7440508	$e(0.9422[\ln(\text{hardness}) - 1.3844])$	$e(0.8545[\ln(\text{hardness}) - 1.386])$

Site-Specific Criteria

- **OAC 785:45, Appendix E**
- **Water Effects Ratio (WER)**
 - **Adjustment factor which accounts for site-specific water chemistry effects on metals toxicity (i.e. difference between toxicity of metal in lab water vs. site water)**
 - **OWRB’s “Guidance for Developing Site Specific Criteria for Metals” (2003)**
 - **EPA’s “Streamlined Water-Effect Ratio Procedure for Discharges of Copper” (2001)**

Idabel and Mud Creek

- Idabel POTW design flow 2.56 cfs, 1 cfs background
- Mud Creek (410200)
- 32 mg/L (OAC 785:46, Appendix B)
- Not achieving permit copper limits
- Workplan approved 07/07/15



Water Effects Ratio

- **General Requirements**
 - Two events, min 1 mo apart, stable flow
 - Upstream and effluent, analyzed at permit dilution
 - Plant performing average or better
 - *Ceriodaphnia dubia* or *Daphnia magna*
 - Side-by-side 48-hr LC50, lab and site water spiked with metal salts
- **Idabel WER Study**
 - Final report approved by OWRB staff Sept 1, 2017

Proposed Criteria

- **WER** = Lesser of Lab Water LC50 or SMAV/Site Water LC50
- **fWER** = $\exp [\sum \ln(\text{WER}_i)/n]$
- **Dissolved Translator(f)** = geo mean of (D:T) of 10 paired analyses
- **Criteria Translator (T)** = $\text{fWER} \times f$
- **Acute Site-Specific Total Criterion (S_{ast})** = $C_{\text{asd}} / (\text{f} \times \text{fWER}_d)$
- **Chronic Site-Specific Total Criterion (S_{cst})** = $C_{\text{csd}} / (\text{f} \times \text{fWER}_d)$

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

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

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Ceriodaphnia dubia