

Molybdenum Water Quality Standards Update to Stakeholders

June 26, 2019



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Welcome and Introductions



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Overview

- **Wrap-up on Analysis of Molybdenum Sources, Water Management, and Treatment Alternatives Report by Stantec (Jerry Raisch, Vranesh and Raisch, LLP)**
- **Status of Scientific Reviews and Postponement of November 2019 Molybdenum Standards Rulemaking Hearing**
 - **Update on ATSDR and Postponement (Blake Beyea, WQCD)**
 - **Update on EPA (Jerry Raisch, Vranesh and Raisch)**
- **Extension of the Molybdenum Temporary Modification in the December 2019 Temporary Modifications Rulemaking (Jerry Raisch and Justine Beckstrom, Vranesh and Raisch, LLP; Jim Finley, Stantec)**
 - **Discussion of potential issues and approaches for numeric temporary modifications (All)**
- **Update on the CSU Study, “Effects of Chronic Molybdenum Exposure in Drinking Water on Molybdenum Metabolism and Production Performance of Gestating and Lactating Beef Cattle Consuming a High Forage Diet.” (Justine Beckstrom, Vranesh and Raisch, LLP)**
- **Next Steps**

Molybdenum Sources, Water Management, and Treatment Alternatives Report by Stantec



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Status of Report

- **Draft Report, “Analysis of Molybdenum Sources, Water Management and Treatment Alternatives” (May 6, 2019)**
- **Draft made available to Stakeholders on May 7, 2019**
- **Comments requested by June 1, 2019**
 - **No comments received**
- **Climax will share finalized written report with the stakeholders and Commission by July 1, 2019**

Status of Scientific Reviews and Postponement of Molybdenum Standards Rulemaking Hearing



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ATSDR and Nov. 2019 RMH Postponement

- **ATSDR revising its draft Toxicological Profile for Molybdenum**
 - **ATSDR is working on the revisions**
 - **Completion date unknown at this time**
 - **WQCD in touch with ATSDR**
- **November 2019 hearing postponement**

Status of EPA

- **EPA Health Advisory**
 - **Health advisories are guidelines**
 - **EPA's draft 1993 health advisory for Mo based on now-discredited Koval'skiy (1961)**
 - **EPA recognizes Mo health advisory is out of date, but EPA resources are currently focused on higher priority issues**
- **EPA's positions in 2017 Molybdenum Standards Rulemaking:**
 - **Results of the three studies submitted by Climax “should be used to derive an Ambient Water Quality Standard instead of the study posted on EPA's IRIS site (Koval'skiy et al., 1961) and instead of Fungwe et al. (1990).”**
 - **EPA calculated 10,000 µg/L TVS “would be protective of the water supply use classification and consistent with Clean Water Act (CWA) requirements.”**

December 2019 Temporary Modifications Rulemaking



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Segment 14 Molybdenum Temporary Modification

- **Blue River Segment 14 (COUCBL14), Tenmile Creek**
- **Narrative temporary modification of molybdenum (chronic) = “current conditions,” expires 6/30/2020**
- **WQCC extended temporary modification in January 2018**
 - **Date of 6/30/2020 based on anticipated finalization of ATSDR tox profile for Mo in time for Nov. 2019 RMH**
- **SBP language directs development of a numeric temporary modification if extension is warranted**
 - **Due to delay in ATSDR, Nov. 2019 RMH has been postponed**
 - **Extension of temporary modification based on unanticipated federal delays**

Establishing a Numeric Temporary Modification – Considerations and Challenges

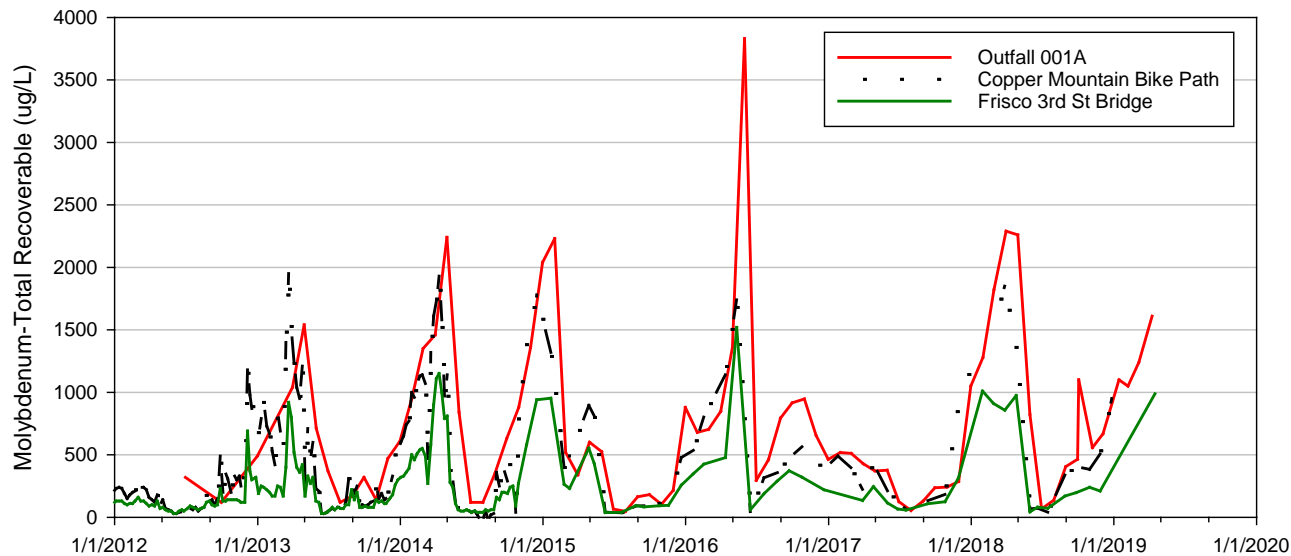
- **No established procedure**
- **Reg. 31, Section 31.7(3)(d): “A numeric value representing existing quality at the time of adoption.”**
 - **How do you identify “existing quality”?**
 - **What date or date ranges do you use to establish “existing quality”?**
 - **Seasonal variability in Mo concentrations**
- **Potential future application to Climax’s discharge permit**
 - **Existing quality in Reg. 31 looks to 50th percentile of data (i.e., ½ of the data points exceed the standard)**
 - **WQBEL is a 30 day average, and cannot be exceeded**
- **Climax has modified its near-term mine plan to assure “current conditions” are maintained**

Establishing a Numeric Temporary Modification

– Options Examined by Climax

- **Statistical**
- **Maximum previous period**
- **Seasonal**
- **Chemical mass loading**

Effluent and Instream Data

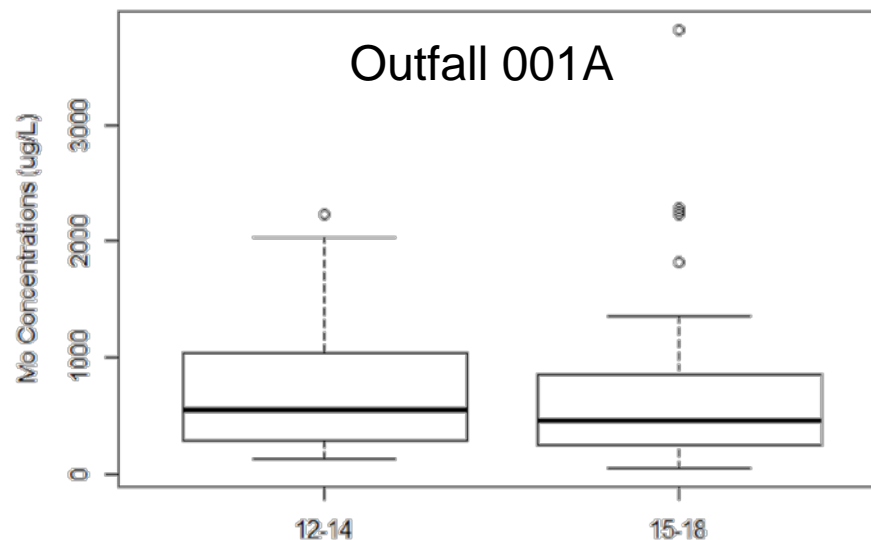
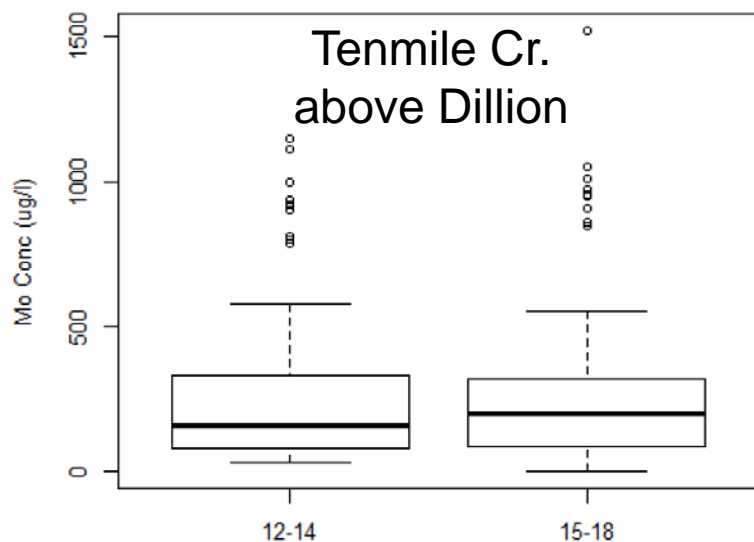


- **Saw-toothed shape strongly influenced by snowmelt dominated hydrologic cycle**
- **Key conclusion of Commission Statement of Basis, Specific Statutory Authority and Purpose (December 10, 2018) – concentrations shown in figure consistent with maintenance of “status quo” per requirement of “current conditions” temporary modification**
 - **If numeric operative value(s) to be established, consideration will be given to temporal and spatial variability in molybdenum concentrations**
- **Establishing a numeric operative temporary modification value(s) should be consistent with the data**

Approaches and Options

Statistical

- 303(d) listing methodology
 - Wilcoxon Rank Sum Test
- } Division's Rebuttal – November 19, 2018

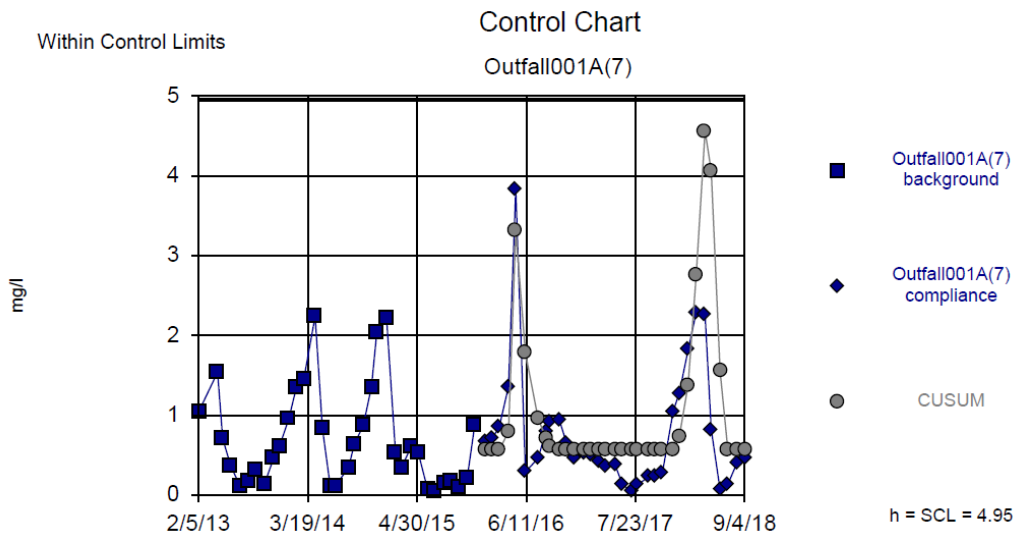


- Thick black line is the median (50th percentile) value
- Wilcoxon Rank Sum test (shown above) compares statistically the medians
 - For these datasets, no statistically significant difference
- 303(d) methodology is effectively a direct comparison (i.e., greater than, less than, equal to)
- Pro – good methods for comparing populations of data
 - However, not applicable in this case because we aren't comparing populations of data
- Con – would need to recognize in the permit that 50 percent of the data will have concentrations greater than the median and still be in compliance; not conducive to normal time frame of permit limit evaluations (i.e., 30-day average or daily maximum)

Approaches and Options

Statistical

- Shewhart CUSUM Control Chart (Climax Sur-Rebuttal November 30, 2018)
 - Method used routinely by EPA

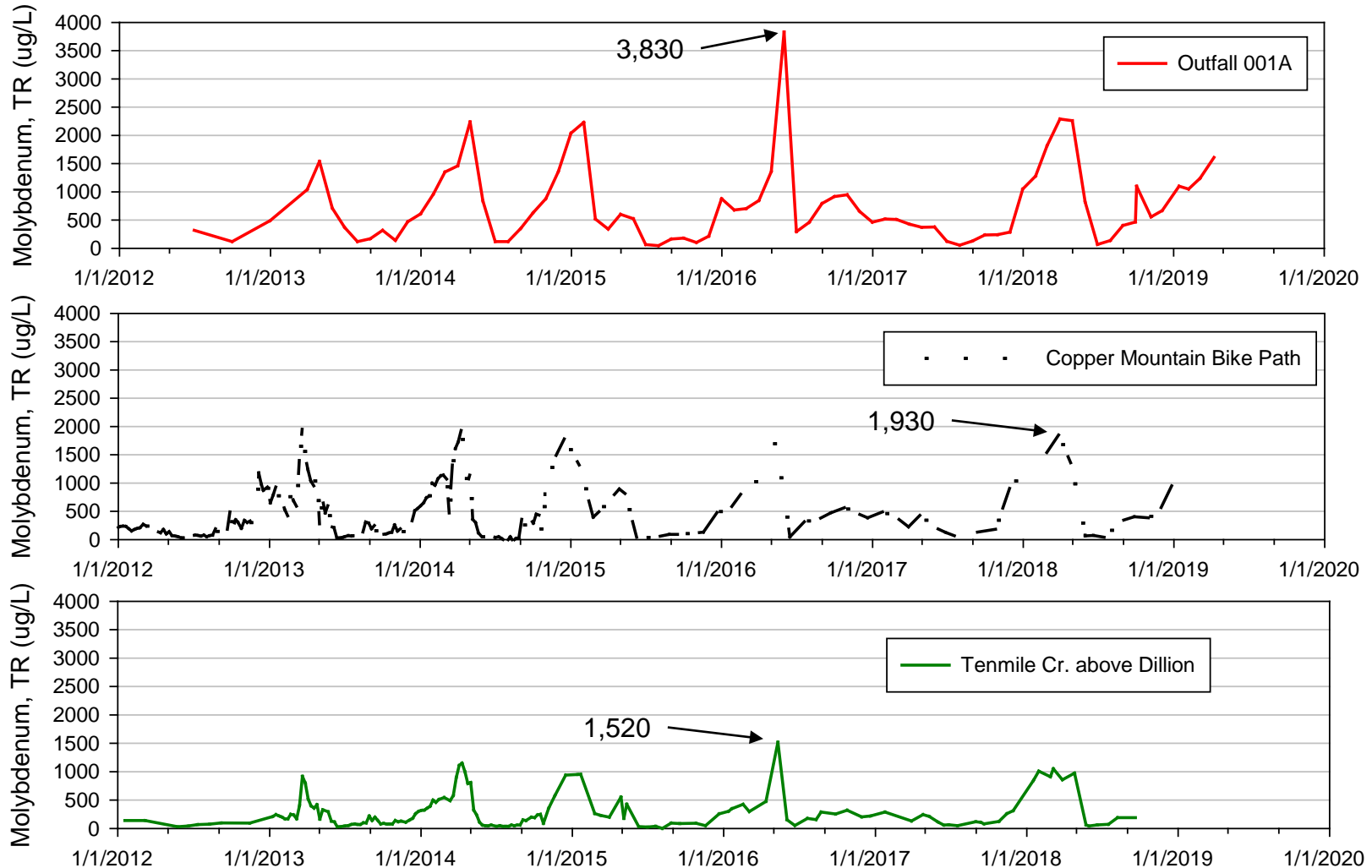


Background Data Summary (based on square root transformation): Mean=0.7521, Std. Dev.=0.3682, n=34. Seasonality was detected with 95% confidence and data were deseasonalized. Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9732, critical = 0.933. Report alpha = 0.01204. Dates ending 12/2/2015 used for control stats.

- Establish baseline period
- Calculate mean and standard deviation
- Calculate upper control limit (SCL)
 - Mean + 4*standard deviation
- Calculate the cumulative sum (CUSUM)
- CUSUM a sensitive metric of concentration trends (up or down)
- Pro – reflects variability of data; sensitive metric of change; consistent with typical permit limits; well suited to time series data
- Con – ability to convert data to normal distribution

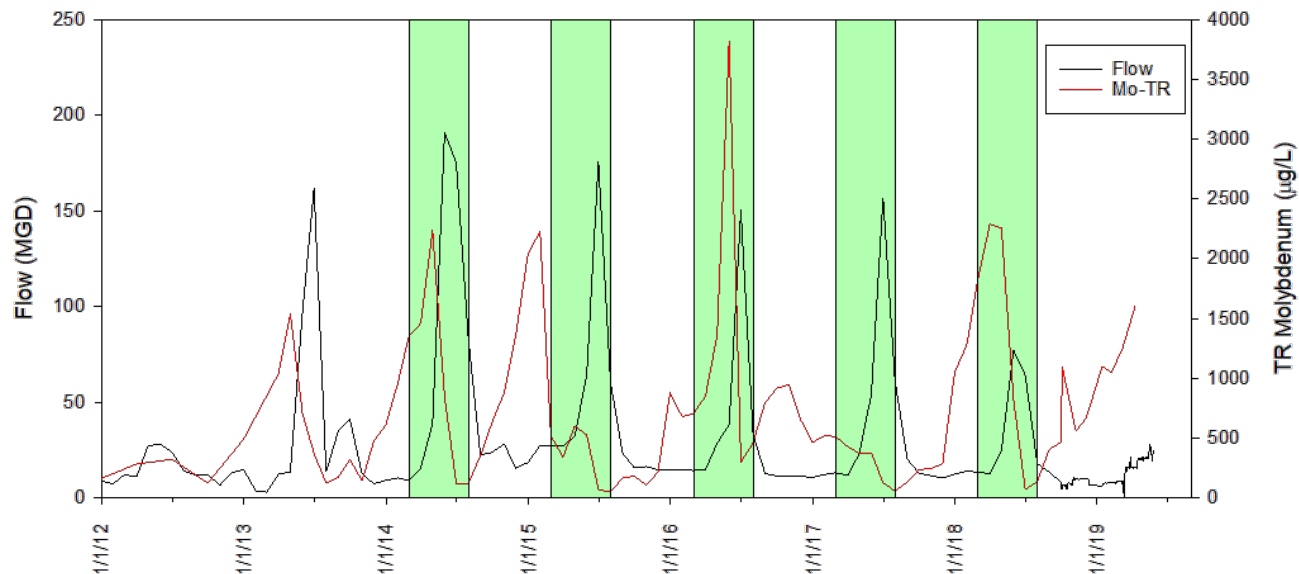
Approaches and Options

- **Maximum Previous Period** (previously used for numeric WQBELs in CO)



Approaches and Options

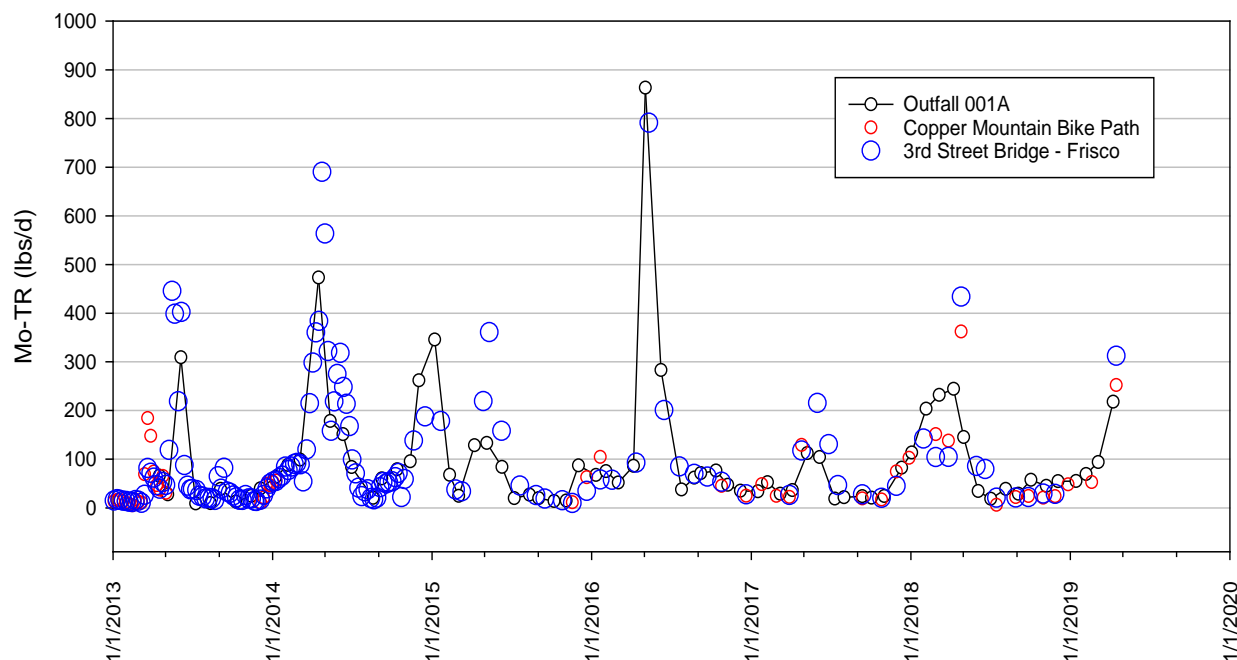
■ Seasonal



- **Pros** – potentially accounts for influence of large fluctuations in flow from snowpack and snowmelt variations
- **Cons** – does not account for variations in mining operation; no control on seasonal flows (compare 2018 to 2019 flows); different snowmelt periods for different locations in the Tenmile catchment

Approaches and Options

■ Chemical Mass Loading



- **Pros** – removes influences of different flow volumes; method to transfer numeric value in Segment 14 to Outfall 001A
- **Cons** – need for coordinated sampling; must still establish numeric value in Segment 14

Climax's Current Thinking

- **Climax currently recommends considering two potential approaches:**
 - **Shewhart CUSUM Control Chart**
 - **Maximum Previous Period**

Next Steps

- **Stakeholder discussion on Climax's current thinking on the potential approaches to numeric temporary modification**
- **Consider stakeholder responses to Climax's current thinking**

CSU Cattle Study Update



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Objectives

- CSU Department of Animals Science research experiment
- The overarching focus of this experiment is to conduct a life-cycle production and health assessment of lactating and gestating beef cattle and their calves exposed to varying doses of Mo
 - Determine the influence of Mo in diet vs water on Mo metabolism and quantify ruminal bypass
 - Compare effects between “normal” copper diet and copper-deficient diet (no supplementation)
- Expands scientific studies to base water quality standard



Considerations

- Conduct under range conditions
- Looks at Mo metabolized in feed vs. water
- Increased water consumption of lactating cows
- Multiple life stages over 1.5 years
- Treatments with no copper supplementation
- No antibiotics (unless needed for sick animal)



Status and Timeline

- Study began at Henderson pastures on August 1, 2018
- Cattle transported to CSU ARDEC on September 24, 2018
- First round calves born April, 2019; second round expected July/August, 2019
- Cows and calves transported back to Henderson pastures on June 17, 2019
- Metabolism studies conducted August 2018 (fistulated steers) and May/June 2019 (study cows)
- Study completion October, 2019
- Results and reporting fall/winter 2019



Stakeholder Outreach on Ag Standards

- Henderson hosted a tour of the cattle study on its pastures in September 2018
- CSU provided a tour of the cattle study and presented an update in March 2019
- As discussed previously, due to continuing nature of the studies, deferring consideration of molybdenum agriculture WQS until a future date
- Henderson will continue to provide updates on the status of the cattle studies

Next Steps



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Next Steps

- **Alternatives Report:**
 - **July 1, 2019: Climax will circulate report to stakeholders and WQCC**
- **December 2019 Temporary Modifications RMH:**
 - **July 15, 2019: Climax's proposal for extension of numeric temporary modification for Mo due to WQCC**
 - **Sept. 18, 2019: Estimated date for PPHS**
 - **Oct. 16, 2019: Estimated date for RPHS**
 - **Nov. 20, 2019: Estimated date for Rebuttals**
 - **Dec. 9, 2019: Rulemaking hearing**
- **Stakeholder Engagement:**
 - **Potential stakeholder meeting(s) in advance of Temporary Modifications RMH**



Discussion



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