

Elk Valley Water Virtual Open House

November 23, 2022

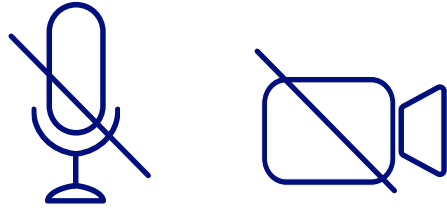
The Teck logo is displayed in a bold, blue, sans-serif font. It is positioned in the lower right quadrant of the slide, which has a white background. The logo consists of the word "Teck" in a single line.

Welcome and Land Acknowledgement

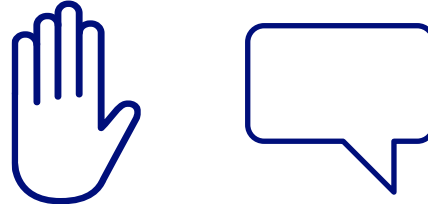
Rory O'Connor
Manager, Social Responsibility



Using Zoom



Please turn off your video and mute microphones until the Q&A periods



Please feel free to raise your hand or enter any questions in the chat. We will address them at the end of each topic.

For further questions or information contact: feedbackteckcoal@teck.com

Agenda

Safety Message

Elk Valley Water Quality Plan Overall Progress

Water Treatment Facilities Update

Water and Aquatic Health Monitoring Results

Fish Population Results & Recovery Program

Research & Development

Safety share



Health Benefits of Walking

Becoming a regular walker leads to:



Stronger bones



Better range of flexibility and motion



Improved mental health



Lower blood pressure

Elk Valley Water Quality Plan Overall Progress

Matthew Gay, P. Eng

Program Director, Water Strategy



Mining Can Affect Water Quality

Leftover rock from the mining process contains naturally occurring elements including selenium

Water from precipitation and runoff flows through the rock piles and can then carry selenium into the watershed

High concentrations can affect aquatic health



1

2

3

Elk Valley Water Quality Plan

Created collaboratively with the objective to protect the watershed and allow for ongoing mining

- Developed with input from First Nations, US Tribes, Canada and US government agencies, independent scientific experts, public and other stakeholders
- Approved by the Provincial Government in 2014



Plan Objectives

- Stabilize and reverse the trend of selenium and nitrate, manage calcite formation and protect the ongoing health of the watershed
- Allow for continued sustainable mining in the Elk Valley
- Manage adaptively and adjust to new information and research

Collaboration and Data Sharing

- Environmental Monitoring Committee
- Lake Koocanusa Monitoring and Research Committee
- Koocanusa Reservoir Transboundary Monitoring Task Group

2022 Update To Water Quality Treatment Plan

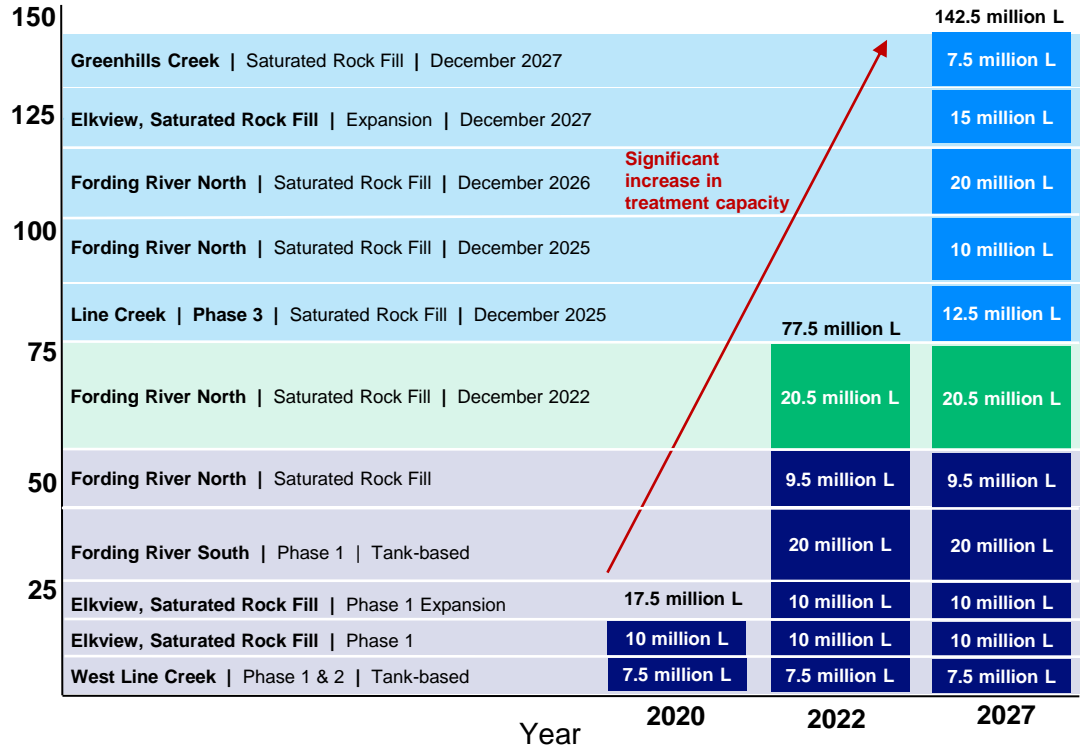
More water treatment online faster

- Compared to 2020
 - ~**4x increase** in treatment capacity by end 2022 (total of 77,500 m³/d)
 - ~**8x increase** in treatment capacity by end 2027 (total of 142,500 m³/d)
- Achieved by advancements in new water treatment technologies
- Stabilizing and reducing the selenium trend in the Elk Valley

Legend

- Future Facility
- Under Construction
- Completed

Millions of Litres per Day



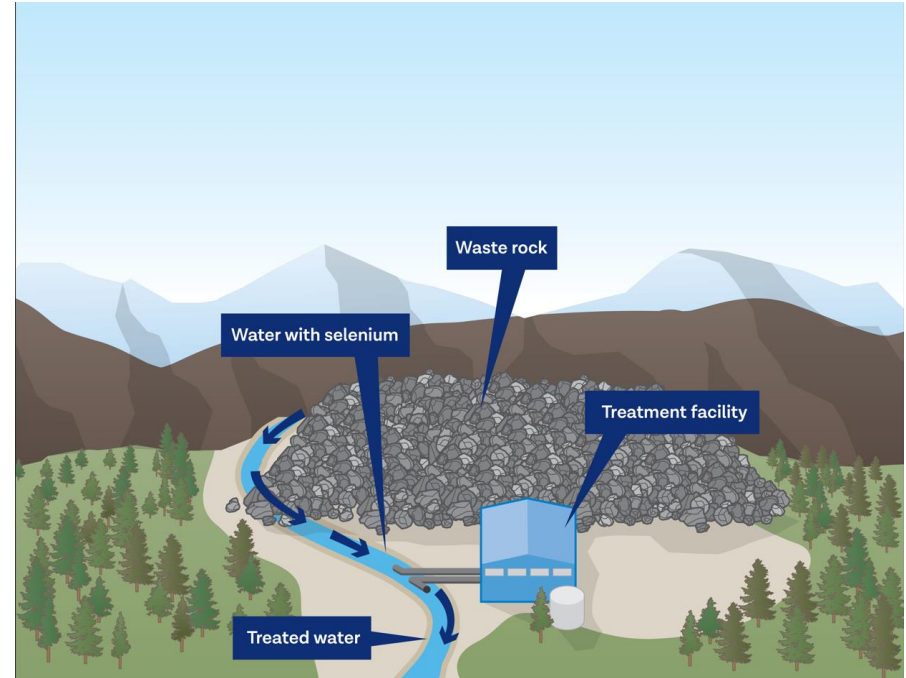
Continued Advancement of Water Treatment Technologies

Two primary methods for water treatment removing ~95% of selenium

Active Water Treatment Facility (“AWTF”)

AWTFs are tank-based water treatment systems designed to remove nitrate and selenium from mine impacted water through the following process:

- Biological treatment to convert dissolved forms of selenium to solid form
- Nitrate is converted into inert nitrogen gas and safely released
- Solid selenium is extracted and safely disposed of in a secure offsite waste facility
- Treated water is discharged

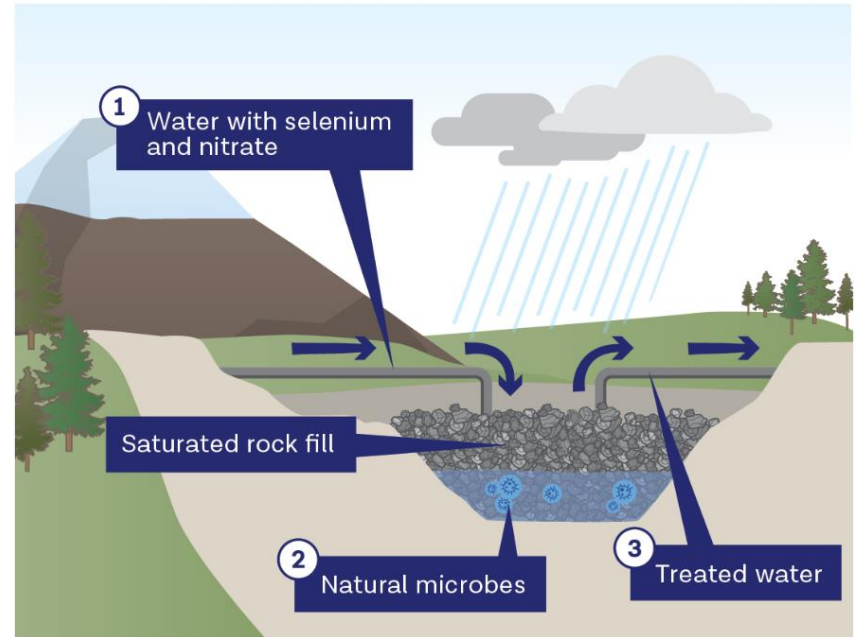


Continued Advancement of Water Treatment Technologies

Two primary methods for water treatment removing ~95% of selenium

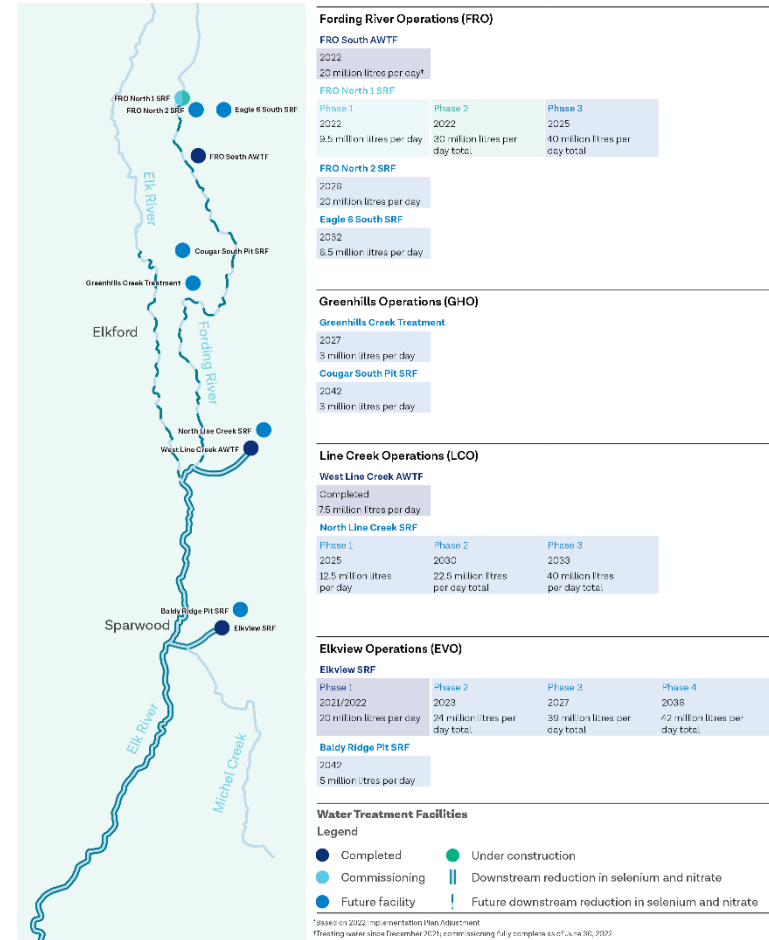
Saturated Rock Fill (“SRF”)

- Saturated rock fill technology was developed through Teck’s research and development program in partnership with leading water quality experts
- SRFs enhance and use naturally-occurring biological processes in former mining areas that have been backfilled with rock and saturated with water to remove selenium and nitrate
- Natural bacteria convert selenium into a solid form which remains stored in the SRF and nitrate to inert nitrogen gas which is safely released
- Treated water is pumped out of the SRF and discharged



Water Treatment Improving Water Quality

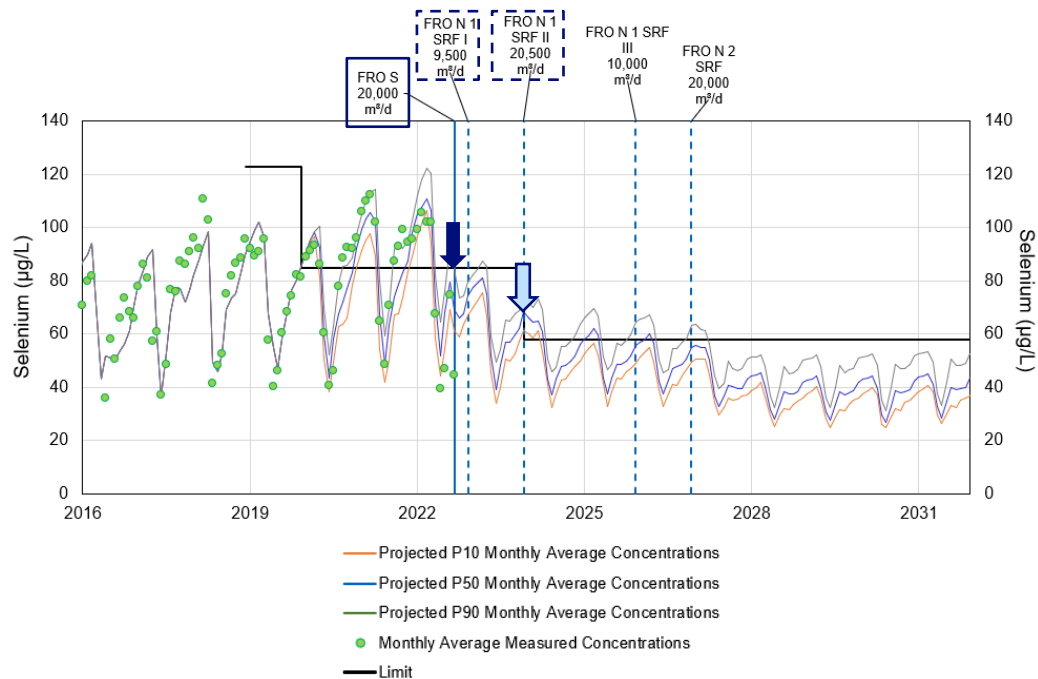
- Three operational facilities
 - Fording River South
 - West Line Creek
 - Elkview Saturated Rock Fill
- Fording River North SRF approaching completion in 2022
- New treatment coming online every year for the next five years to 8x more capacity by 2027
- Continued projected improvements in water quality as facilities come online 2022 & will reach 142,500 cubic meters per day by 2027



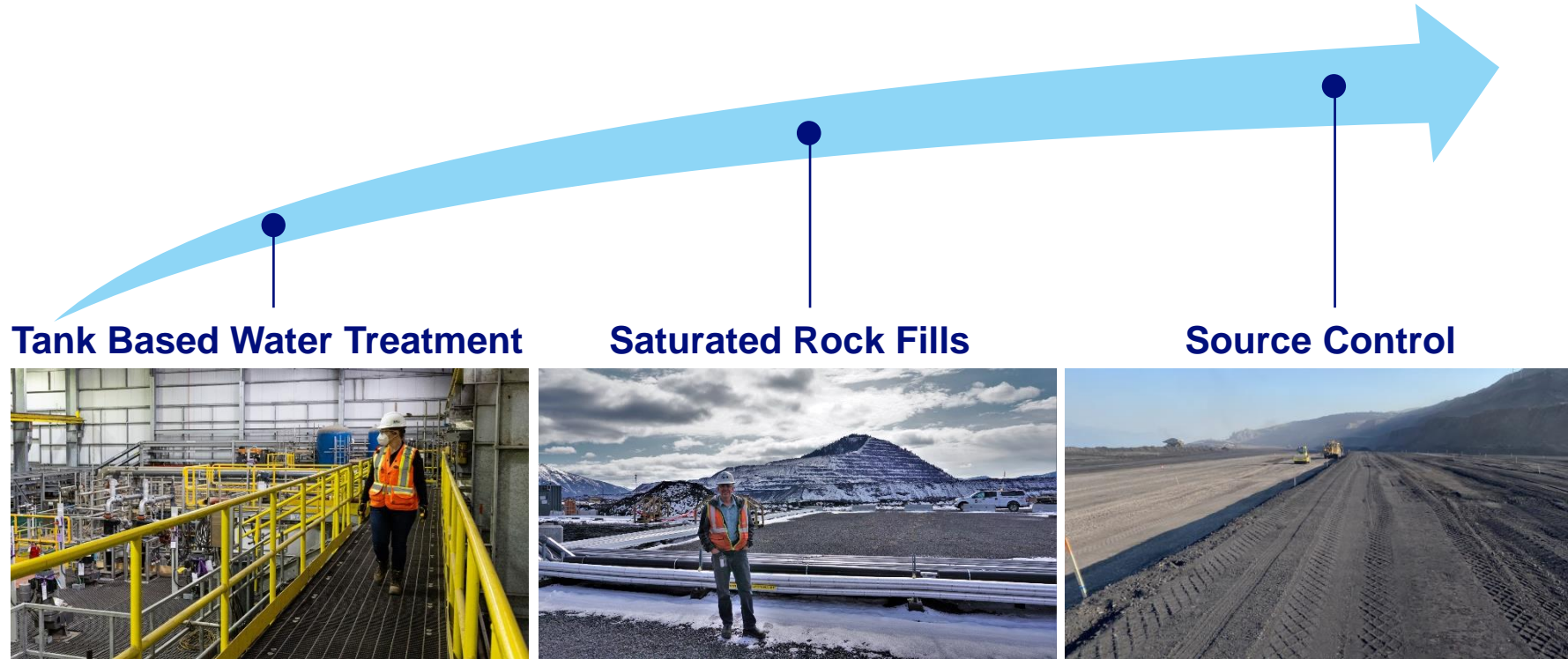
Progressing to Stabilize and Reduce the Selenium Trend

Fording River Compliance Point (FR_FRABCH) monitored data and projected improvements

- Fording River South treatment facility ramping-up to capacity of 20,000 m³/d by end 2022
- Notable improvements in measured selenium and nitrate concentrations
- With addition of 30,000 m³/d in 2023 projected further step change in improving water quality



Progressing Towards Our Goal of Mining Without Water Treatment By ~2040



Water Treatment Facilities Update

Colin Miller, P. Eng
Program Director,
Water Quality & Projects



West Line Creek Operations

Treating 7.5 million litres of water per day



Elkview Operations

Treating 20 million litres of water per day



Fording River Operations

Fording River South ramping-up to treat 20 million litres of water per day



Fording River North Saturated Rock Fill constructed to treat 9.5 million litres of water



Fording River Operations

**Fording River North Saturated
Rock Fill Phase 2 under
construction to treat 20.5 million
litres of water per day**



Progressing Treatment for Calcite

Operating calcite 'anti-scalant based' treatment facilities



Questions?



Water and Aquatic Health Monitoring

Cait Good, R.P. Bio.

Senior Lead, Aquatic Sciences

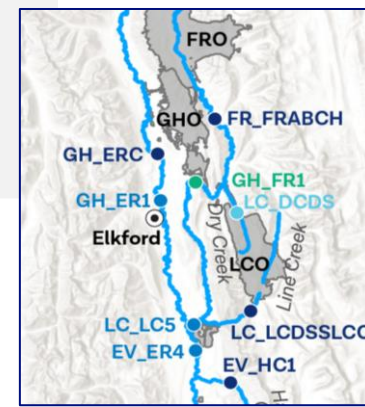


Aquatic Monitoring Programs

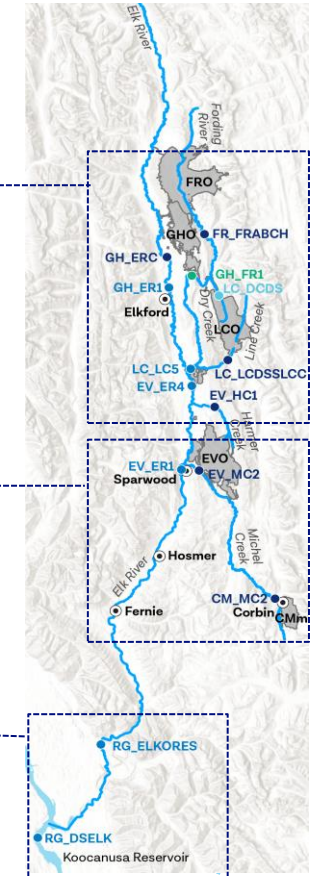
- 150 permitted surface water quality stations sampled monthly (weekly during freshet)
- There are 7 compliance points and 7 order stations with water quality limits and objectives
- Over 100 biological sampling areas in the Elk Valley watershed including the Koochanusa Reservoir
- Integrate information from all monitoring programs into the Regional Aquatic Effects Monitoring Program, including water, sediment, and aquatic biota (algae, bugs, fish, amphibians)

Examples of current monitoring working groups

- Environmental Monitoring Committee
- Koochanusa Monitoring & Research Working Group
- Elk River Watershed Collaborative Monitoring Working Group (facilitated by the Elk River Alliance)



- Order Station
- Compliance Point
- Order Station/Compliance Point
- LCO Dry Creek



Compliance Summary

Year-on-Year Compliance at Order Stations & Compliance Points

Order Stations - % of monthly average concentrations below site performance objectives

Locations	Selenium							Nitrate							Sulfate							Cadmium						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
GH_FR1*	-	-	-	-	-	83%	50%	100%	100%	100%	100%	100%	100%	58%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
LC_LC5	-	-	-	-	-	100%	75%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GH_ER1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EV_ER4	100%	100%	100%	100%	100%	100%	83%	-	-	-	-	-	92%	83%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EV_ER1	100%	100%	100%	100%	100%	100%	100%	-	-	-	-	-	100%	83%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RG_ELKORES	100%	100%	100%	100%	100%	100%	100%	-	-	-	-	-	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RG_DSELK	100%	100%	100%	89%	100%	100%	83%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* GH_FR1 is both an order station and a compliance point.

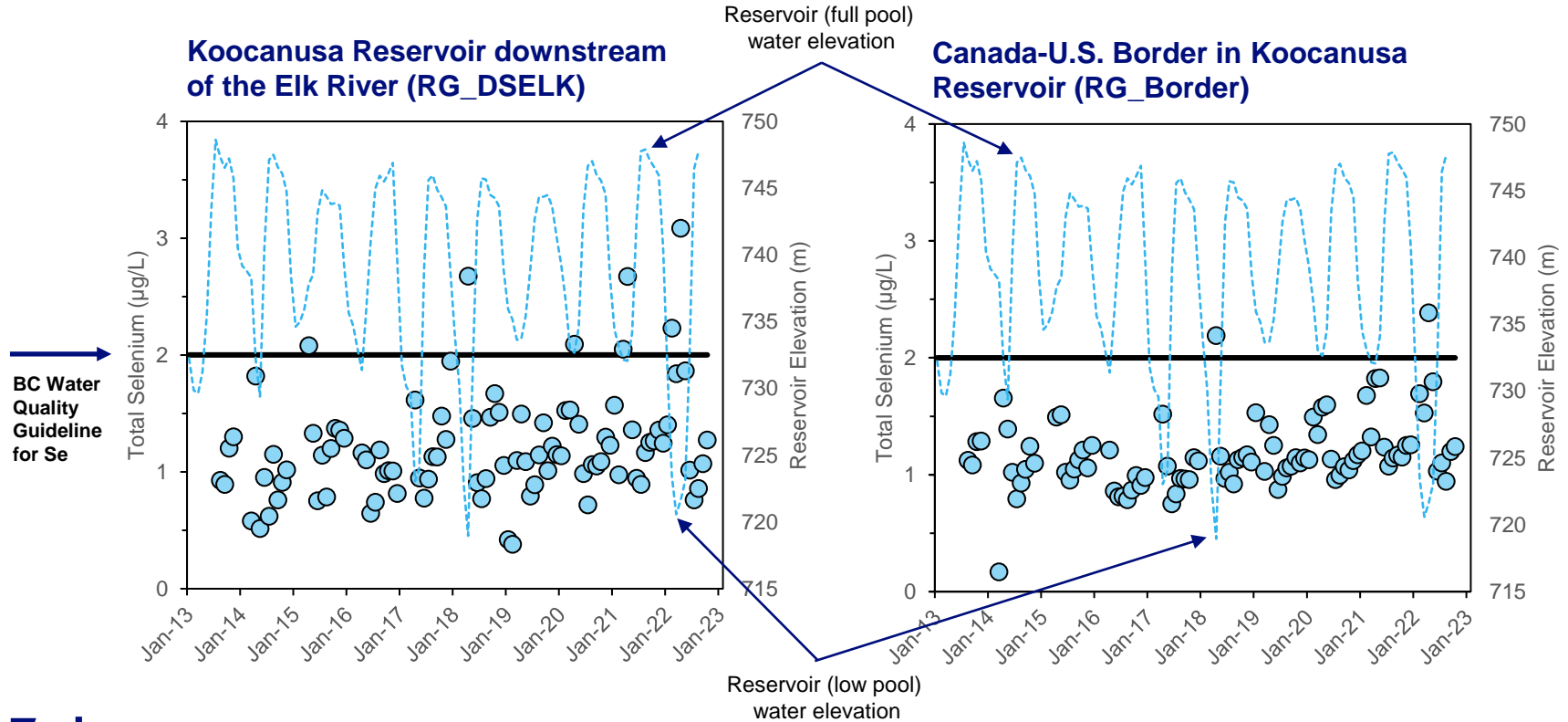
Compliance Points - % of monthly average concentrations below permit limits

Locations	Selenium							Nitrate							Sulfate							Cadmium						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
FRO Compliance Point [‡]	73%	75%	55%	42%	67%	42%	34%	100%	83%	100%	75%	83%	83%	27%	73%	83%	82%	50%	67%	92%	94%	100%	100%	100%	100%	100%	100%	100%
GH_FR1*	100%	100%	100%	100%	100%	83%	50%	100%	100%	100%	100%	100%	100%	58%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GH_ERC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
LC_LCDSSLCC	100%	100%	75%	50%	100%	100%	100%	75%	25%	8%	8%	42%	25%	25%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EV_HC1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EV_MC2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
CM_MC2	100%	100%	100%	100%	100%	100%	100%	100%	100%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

[‡] FR_FRCP1 was the FRO compliance point from January 1 to March 10, 2021 and FR_FRABCH was the FRO compliance point from March 11, 2021 onward; this compliance record reflects the weighted average for both locations.

* GH_FR1 is both an order station and a compliance point.

Water Quality Monitoring Results (Total Se) in Koochanusa at RG_DSELK and RG_Border



Water Quality Early Warning Triggers

- Developed as part of Teck's Adaptive Management Plan
- Provide early notification of unexpected potential increases in water quality concentrations that may require a management response
- Developed for the four order constituents (selenium, nitrate, sulphate, and cadmium) plus twelve other mining-related constituents
- We screen data against the early warning triggers at compliance points and order stations quarterly and annually, and results are provided in both our quarterly and annual water quality reports



Benthic Invertebrate Sampling

- Benthic invertebrates are organisms that live on the bottom of the water body (or in rocks or sediment) and are an important food source for fish, amphibians and aquatic-dependent birds
- Methods for monitoring benthic invertebrates are well developed and standardized
- Monitor benthic invertebrates to understand concentrations of selenium in tissue as an indicator for potential risk to consumers



Stonefly (Plecoptera)



Caddisfly (Trichoptera)



Mayfly (Ephemeroptera)

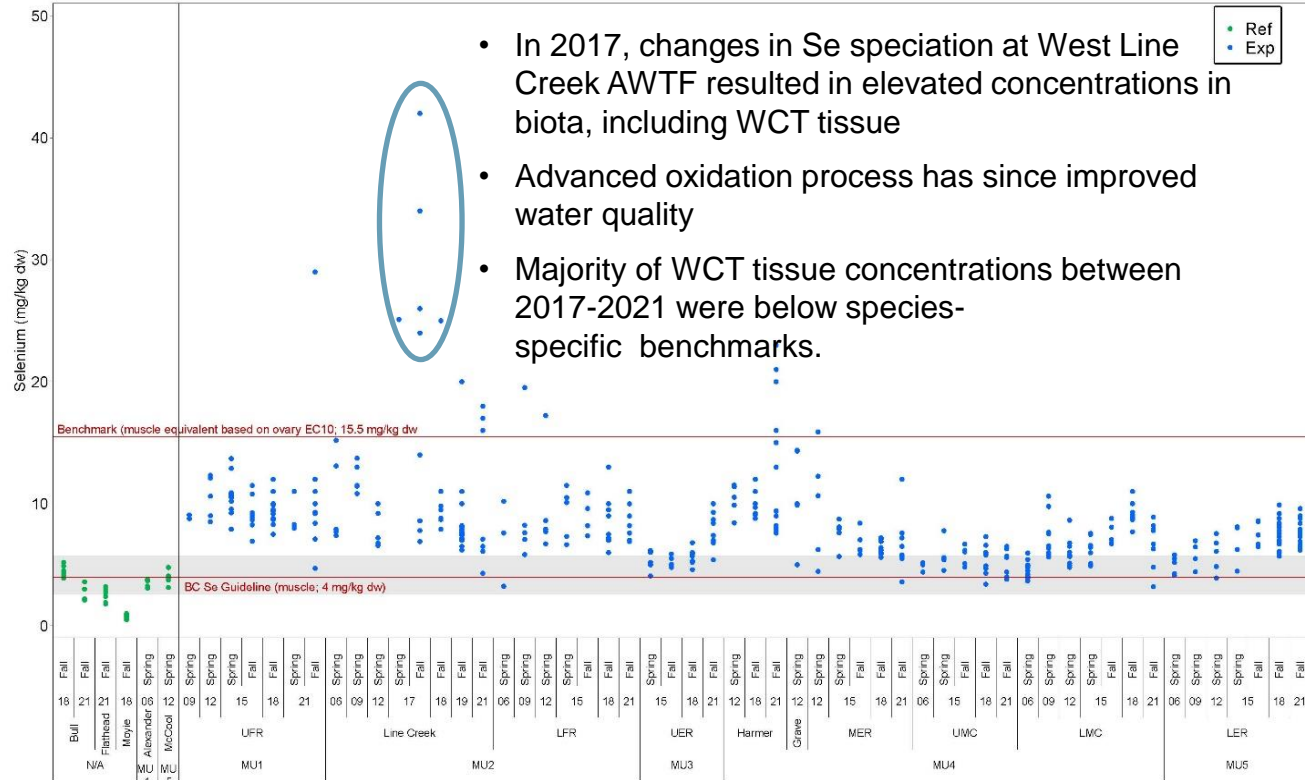
2021 Benthic Invertebrate Tissue (BIT) Chemistry

- Over 900+ benthic tissue samples were collected in 2021 to support local and regional scale monitoring questions
- In 2021, the majority of BIT selenium concentrations were within the normal range for reference areas and below ecological benchmarks for effects
- In 2021, mainstem concentrations majority of samples below ecological benchmarks for effects
- Some 2021 data in tributaries indicates higher selenium concentrations immediately downstream of sediment ponds; these localized areas have focused monitoring programs and plans are being developed for treatment and mitigation



Tissue Selenium in Westslope Cutthroat Trout (WCT)

- WCT muscle samples are collected every three years under the RAEMP
- In 2021, the majority of selenium concentrations in WCT tissue in the Elk Valley were below the species-specific benchmark (effects threshold)



Integrated Monitoring Results

- Most of the watershed (>90% of flowing habitat) appears to be healthy and stable with no indication of adverse effects to invertebrates or risk to fish
- A few areas had higher than expected benthic invertebrate tissue selenium concentrations and further evaluation is underway
- Localized changes are not widespread, and are being monitored in more detail through focused programs
- Integration and interpretation of aquatic monitoring results are presented in the Regional Aquatic Effects Monitoring Program (RAEMP)



Data Sharing: Opportunities for Public Access



Research and Monitoring Reports:

www.teck.com/sustainability/sustainability-topics/water/water-quality-in-the-elk-valley/research-and-monitoring-reports/



Environmental Monitoring System (EMS) Database (Ministry of Environment and Climate Strategy)

<https://a100.gov.bc.ca/pub/ems/indexAction.do>



Kootenai Reservoir Data (WQX) Data Portal (USA Environmental Protection Agency)

www.epa.gov/waterdata/water-quality-data

Teck

Regional Water Quality Model

Surface Water Monitoring

Kootenai Monitoring >

Groundwater Monitoring

Chronic Toxicity Testing

Aquatic Effects Monitoring

Calcite Monitoring

Calcite Biological Effects

Other Reports

Data Sharing: Opportunities for Public Access

Annual Environmental Monitoring Committee (EMC) Public Meeting

- November 30, 2022, at 6:00 p.m. MST (online)
- Presentation and Q&A on Teck's monitoring results with EMC:
 - Independent aquatic scientist
 - BC Ministry of Environment and Climate Change Strategy (ENV)
 - BC Interior Health (IH)
 - Representatives from Teck



Questions?



Fish Population Results & Recovery Program

Bronwen Lewis, R.P. Bio.
Senior Lead, Fish Monitoring



Fish Population Programs

Where we have come from and where we are going

- Isolated by waterfalls, high elevation, genetically pure-strain Westslope Cutthroat Trout (WCT)
- monitoring commenced in 2012, changed to annual program in 2019
- Upper Fording River and Grave-Harmer Creeks focus of current population studies
- Line Creek for WCT and Bull Trout for 20+ years
- Rigorous programs developed with input from KNC, Province, and Fisheries and Oceans Canada (DFO)



Fish Population Programs Methods and Assessment

Field Methods

- Spring Redd surveys throughout the mainstem and tributaries

September Census

- Electrofishing
- Daytime downstream adult snorkeling
- Exploring methods to reduce fish handling in response to input from KNC
 - Nighttime upstream snorkeling
 - Nighttime dip-netting walks for fry
 - Underwater camera surveys

Analysis Methods

- Improved population dynamics statistics
- More study sites for holistic watershed view
- WCT Population Model to predict changes
- Developing a movement study



Upper Fording River – Population Monitoring

Summary of Results

Population studies updated to understand the variation and uncertainty in population dynamics

Adult fish abundance (>200mm):

- 2019 ~330 adults
- 2020 ~440 adults
- 2021 ~1500 adults
- 2022 field observations indicate another positive increase
- 2021 - Juvenile fish (under 200 mm; Age 1, 2, 3 and some 4 year olds) best estimate approximately 11,000 fish



Photo: Upper Fording River (Sept 2021)

Upper Fording River–Population Monitoring



In 2020

500 mm

1714 g



Recaptured In 2022

508 mm

2045 g

Currently our largest fish in the database in the UFR in 2022

Upper Fording River – September 2021



Upper Fording River Recovery Action Plan

Recovery Action Plan includes habitat projects over next 5 years

Habitat projects will address limiting factors of the system by:

- Improving fish passage for multiple life stages
- Restoring the channel form and function
- Creating/rehabilitating tributary habitat
- Re-establishing riparian ecosystems

Improvements to habitat, water quantity and water quality will support recovery of the population



Grave-Harmer WCT Population

- Another pure strain, isolated WCT population
- Small body form compared to Upper Fording River fish
- Relatively cold system with groundwater influences
- Young-of-Year fish are small, fish are also slightly smaller in Harmer Creek than Grave Creek
- Population experienced reduced juvenile recruitment success from 2017-2019
- In 2020 and 2021 recruitment was successful
- Evaluation of Cause process also initiated, and report will be available when completed
- Recovery Program for Grave-Harmer in planning stage



Questions?



Research & Development

Liz Karbasheski, PhD
Manager, Research & Development



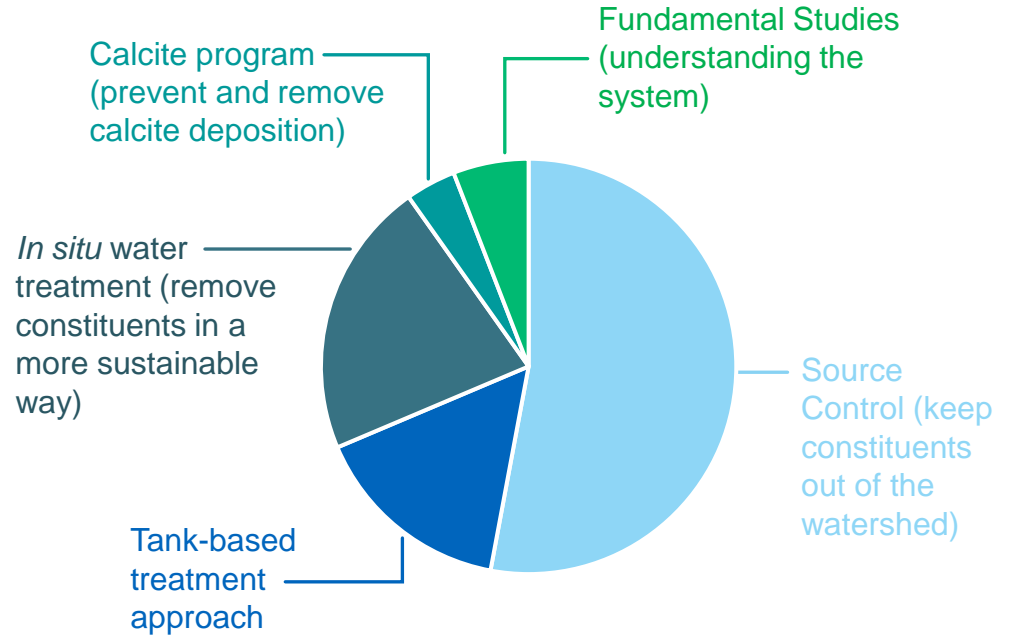
Broad Research and Development Portfolio

More than 20 projects across five programs planned for 2023

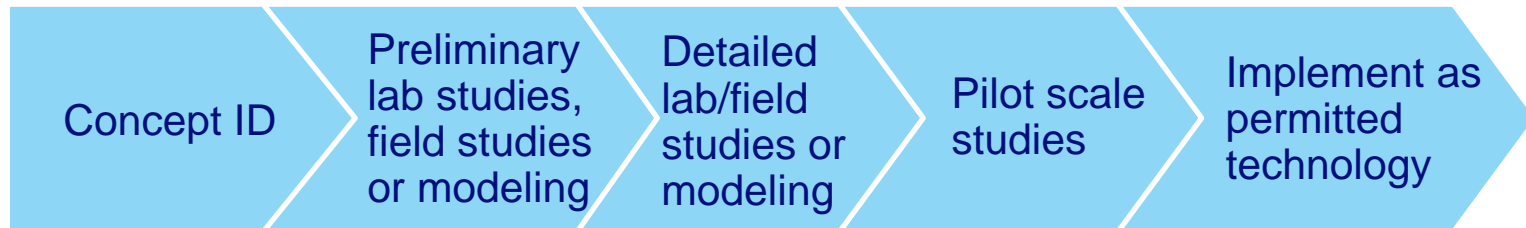
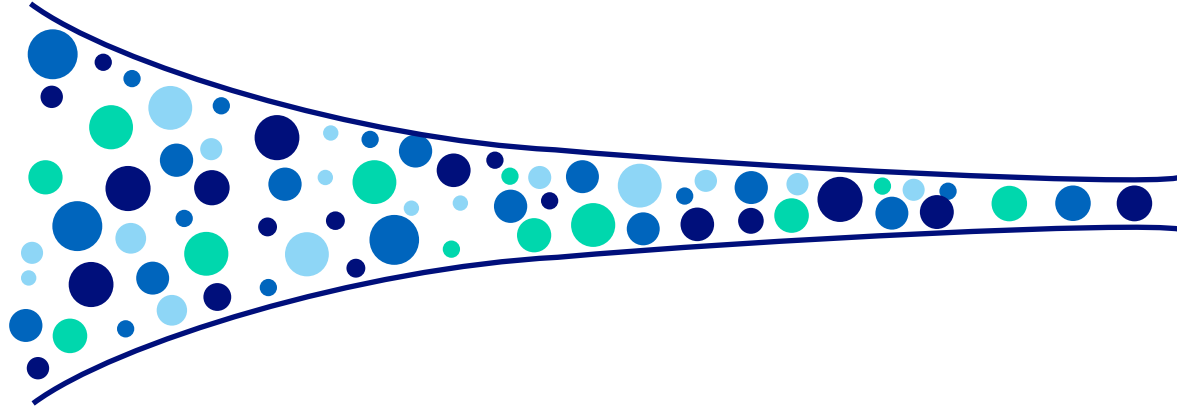
Investment shifting to manage constituents more sustainably and at source where possible

Research program designed to address:

- Compliance
- Opportunity to improve sustainability
- Understanding system with respect to predicted water quality and levers that affect it.

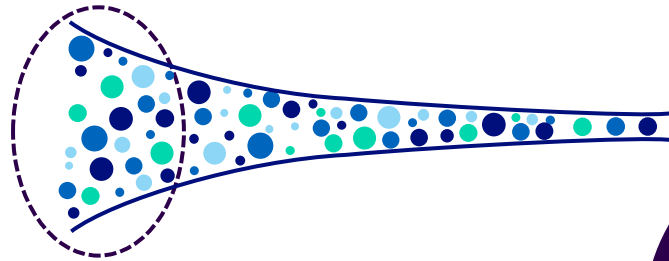


Teck Coal Research and Development Process



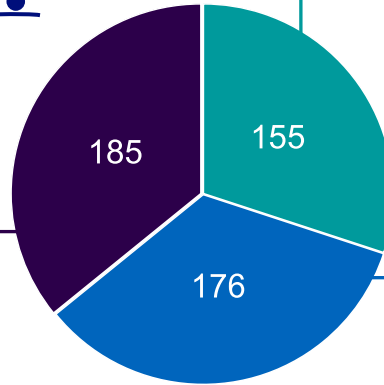
Source control options for legacy waste

Ideation sessions over the course of the summer generated 500 ideas



Topic 1: Geochemical Redox Approaches

- Oxygen consuming covers/ oxygen scavengers
- Coprecipitation, sorption, passivation
- Leachate recirculation and acceleration

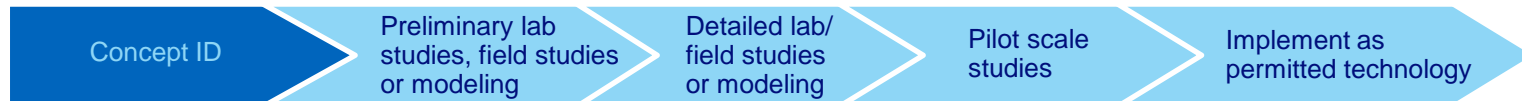


Topic 3: Hydraulic and Other Approaches

- Keeping water out
- Manipulating movement of water within the dump
- Wildcard options

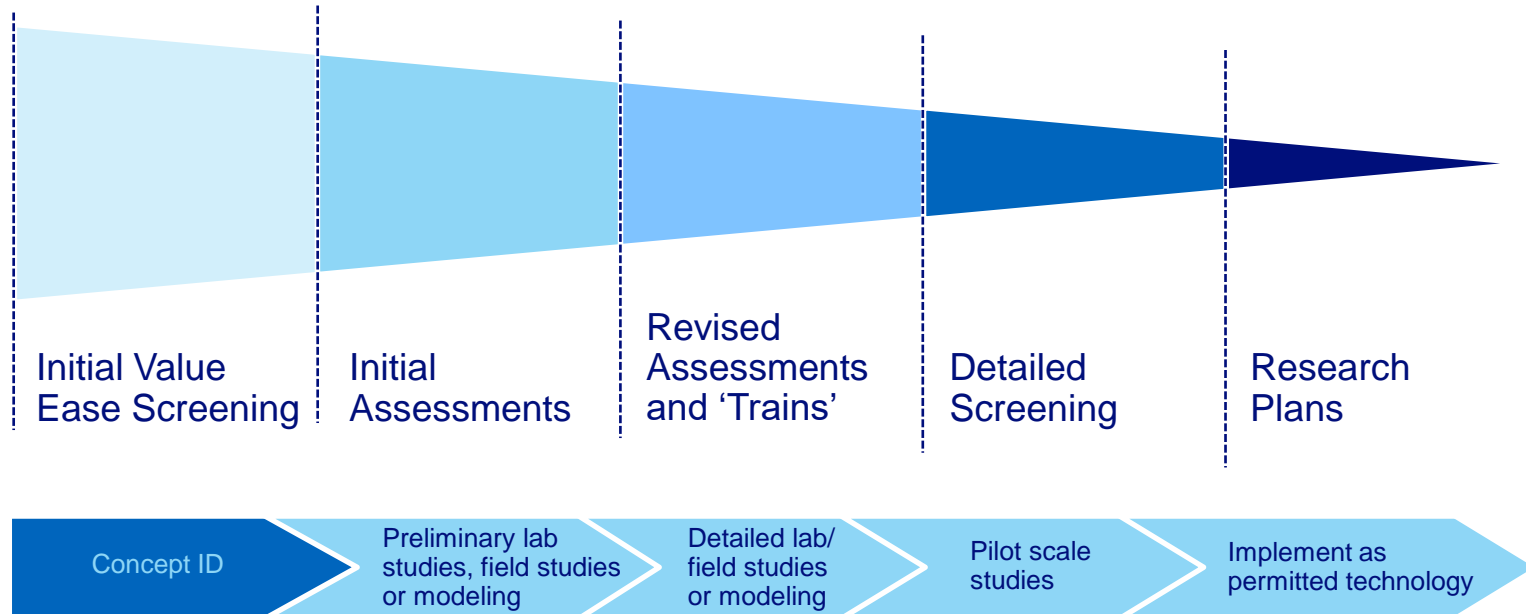
Topic 2: Biological Approaches

- Biocides and biological sterilization
- Inoculation/encouragement of microbial community
- Vegetation/phyto/fungi



Source Control Options For Legacy Waste

Teck will be completing a screening exercise to push ideas along the development pipeline, similar to what was done in 2019-2020.



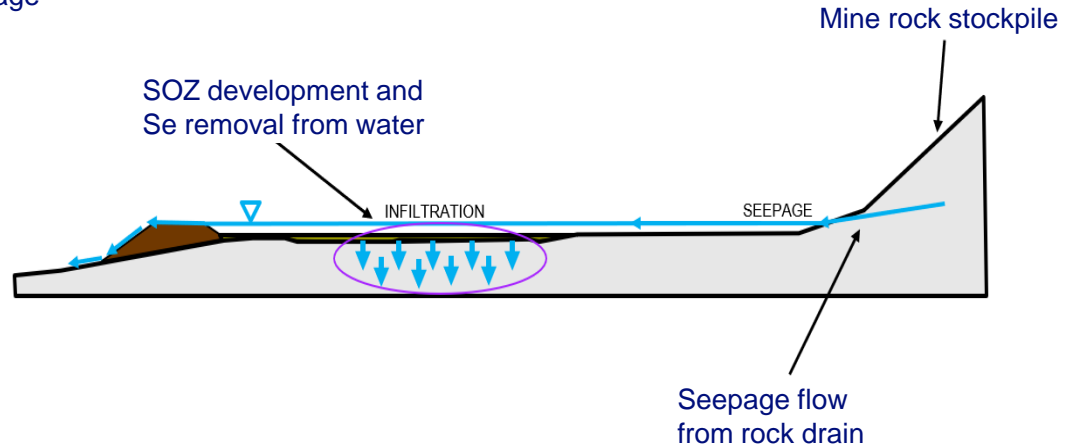
Source control options for legacy waste

Infiltration gallery project going to the field in 2022 at small scale



Rosebowl Spoil

Seepage Flow



Concept ID

Preliminary lab studies, field studies or modeling

Detailed lab/field studies or modeling

Pilot scale studies

Implement as permitted technology

Source Control Options For End-dumped Waste



Literature Review

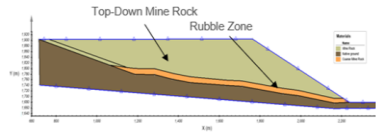


Data Review

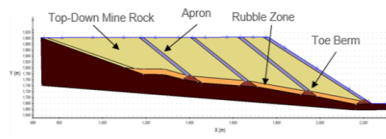


Modeling

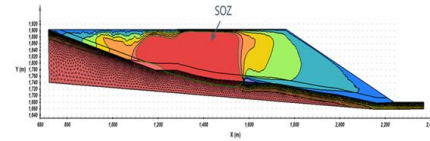
Base Case - Top-Down



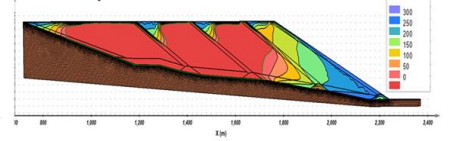
Option 1 - Top-Down with Toe Berm and Apron



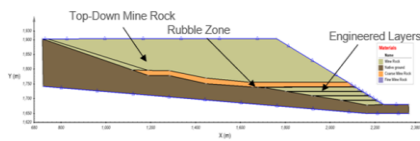
Base Case



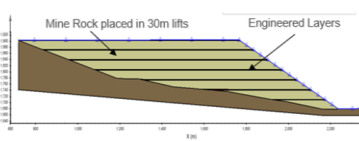
Option 1



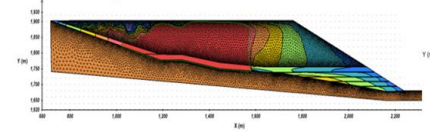
Option 2 - Bottom-Up and Top-Down



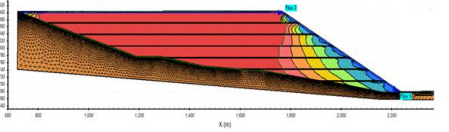
Option 3 - Bottom-Up



Option 2



Option 3



Concept ID

Preliminary lab studies, field studies or modeling

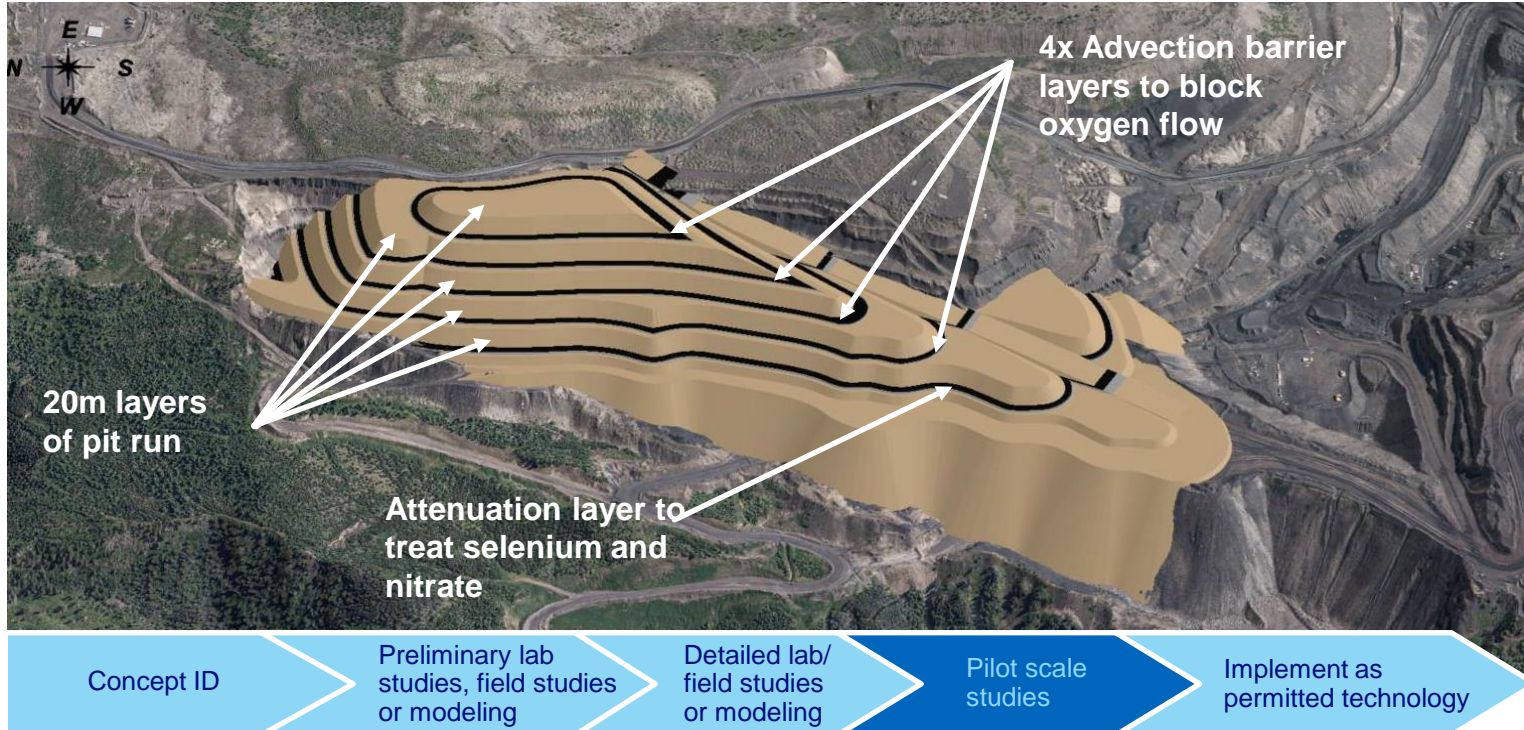
Detailed lab/field studies or modeling

Pilot scale studies

Implement as permitted technology

Source control options for bottom-up placed waste

Cedar North Suboxic Zone construction complete, last lift installed in October

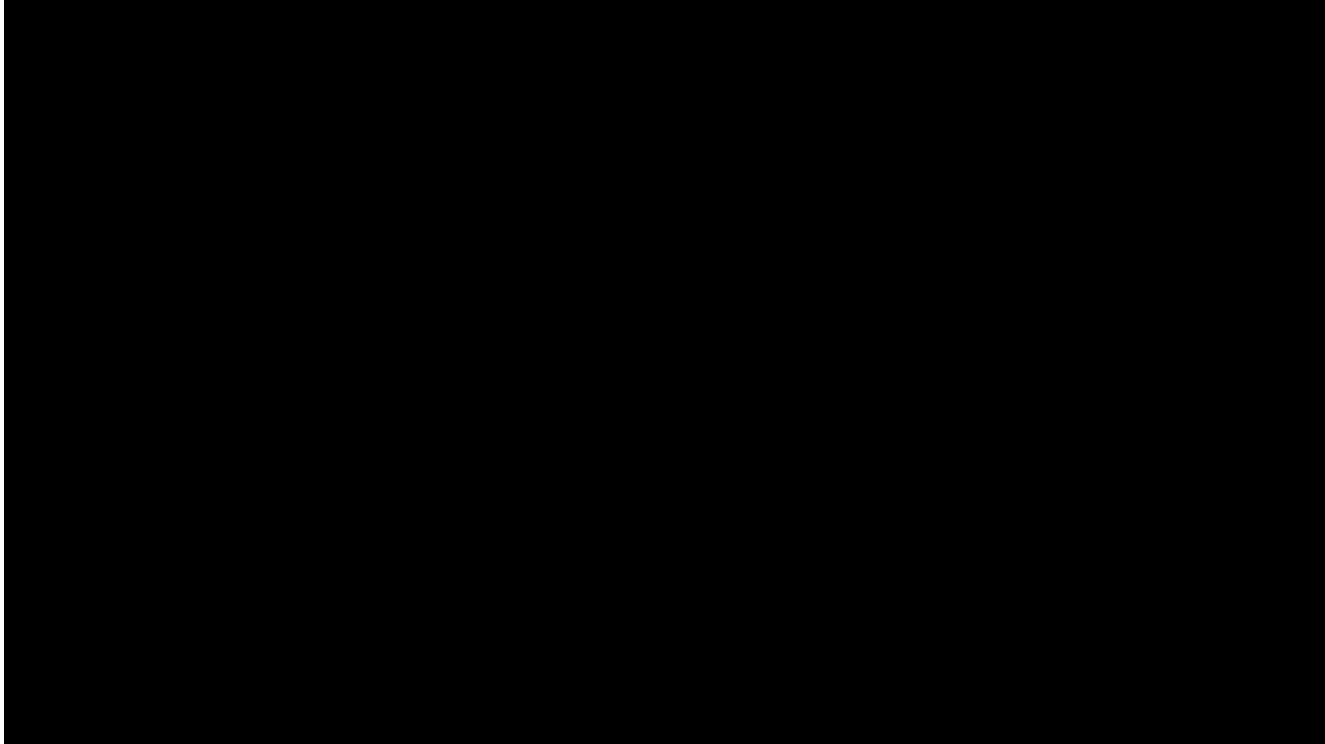


Cedar North Suboxic Zone Trial

Attenuation Layer Construction



Video Footage of Cedar North Construction



Questions?

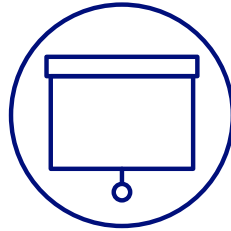


Stay In Touch

Have additional questions about tonight's presentation?

Please email feedbackteckcoal@teck.com

To find Teck's reports on water quality,
please visit www.teck.com/elkvalley



To provide feedback about Teck's Elk Valley Operations:

Phone: 1.855.806.6854

Email: feedbackteckcoal@teck.com

Visit the Communities Office
116 Centennial Square

