



Mining and climate change:

Exploring drivers, trade-offs, and specific tools for understanding climate change risks and opportunities

Presenters

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2. Mark Wiseman, **Avalon Advanced Minerals**
3. John Mullally, **Goldcorp Inc.**
4. Olivia Gamache, **Yamana Gold**

ESG issues are business issues

ESG integration focuses on business issues that may have a material impact on companies' operating and financial performance

Environmental

- Energy efficiency
- Carbon footprint
- Water usage
- Waste management
- Packaging
- Biodiversity management

Social

- Employee attraction and retention
- Diversity
- Pay equity
- Customer data privacy
- Social acceptability of projects/business

Governance

- Climate change
- Cybersecurity
- Corruption and bribery
- Responsible taxes
- Compensation

Climate change is the #1 systemic risk today

“One of the most significant, and perhaps most misunderstood, risks that organizations face today relates to climate change.”



TCFD recommendations

Governance

Disclose the organization's governance around climate-related risks and opportunities.

Strategy

Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.

Risk Management

Disclose how the organization identifies, assesses, and manages climate-related risks.

Metrics and Targets

Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.



<https://www.tcfdhub.org/>

Three takeaways



CC is top of mind for investors in making their investment decisions. They need information from you.



It's never too early to start and you're never too small.



What's in it for you is a better access to capital and ultimately better valuation.

About Millani

Your ESG integration partner in capital markets

We are an advisory firm helping investors integrate ESG into their decision-making process, helping companies communicate about their material ESG issues to investors, and helping capital market participants incorporate ESG into their business lines.



- Extensive capital market experience
- Unparalleled expertise in ESG and its connection to value creation
- Independent advice



Milla Craig, SIPC
Founder and President

- 15+ years in institutional equity sales
- 10+ years advising institutional investors on ESG
- Recognized leader in the Canadian ESG space



Marie-Josée Privyk, CFA, SIPC
Associate

- 11+ years as a sell-side Analyst/Head of Research
- 5+ years in Investor Relations
- SASB's FSA credential



Erica Coulombe, MSc
Associate

- 6+ years in sustainability consulting
- 2+ years advising institutional investors on ESG
- Certificate in Energy & Finance



David Ung
ESG Consultant

- 5+ years in retail brokerage
- 2+ years in responsible investment consulting
- Completing a Masters in Finance



Exploration and Climate Change

Mark Wiseman
VP, Sustainability
Avalon Advanced Materials
March 2019



Introduction

- › PDAC had longstanding commitment to responsible exploration which included environmental performance
- › Guidance in E3+
- › Government of Canada is implementing regulatory measures to reduce GHG emissions

GOVERNMENT CLIMATE POLICIES

GHG Reporting Program

Read about the government's GHG Reporting Program and the new threshold for mandatory reporting

Federal Carbon Pricing "Backstop"

Read about the federal government's carbon pricing "backstop" outlined in the *Greenhouse Gas Pollution Pricing Act*

Clean Fuel Standard

PDAC GUIDANCE & TOOLS

GHG Emissions Calculator

Use this tool to better understand the GHG emissions of your project.

Variables Affecting Energy Use at Exploration

Learn more about what can affect energy use during exploration

Carbon Footprint of Exploration: Avalon Case Studies

Guidance for Reducing GHG Emissions at Exploration

Learn more about opportunities to reduce GHG emissions at exploration

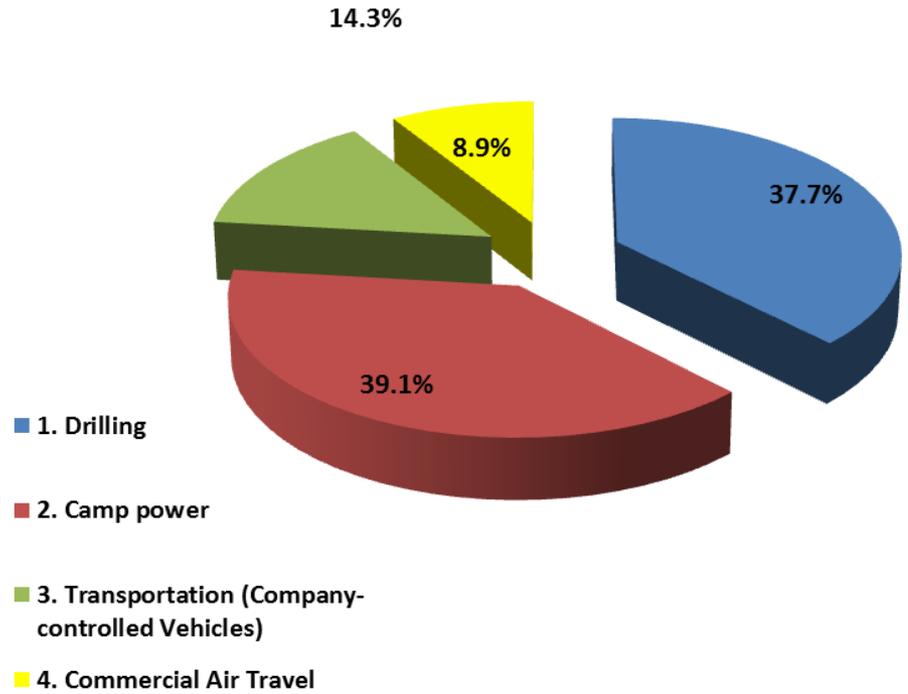
ROLE OF THE MINERAL INDUSTRY - LOW CARBON FUTURE

Role of the Mineral Industry in the Move to a Low Carbon Future

Industry Support

GHG Emission Calculator

Emissions Distribution - Project Level



	Energy Sources					
1. Drilling	#1	#2	#3	#4	#5	Total
Fuel Type	Heavy Fuel Oil	Heavy Fuel Oil	Diesel	Kerosene	Light Fuel Oil	
CO ₂ eq factor (kg/liter)	3,176	3,176	2,705	2,570	2,653	
Annual Consumption (liters/year)	1,000	1,000	1,000	1,000	1,000	
CO ₂ eq - Annual Emissions (kg/year)	3,176	3,176	2,705	2,570	2,653	
CO ₂ eq - Annual Emissions (tonnes/year)	3.18	3.18	2.71	2.57	2.65	14.28
	Energy Sources					

Variables Affecting Energy Use in Exploration

- › **Presence or absence of a camp**
- › **Camp heaters:** efficient modern electric controlled vs. older, reliable (but less efficient) models
- › **Camp or drill site access:** fly-in increases GHG emissions vs. land transport
- › **Climate:** cold climates generate more GHG emissions than mild climates
- › **Diameter of core:** larger core consumes more diesel during drilling than smaller core
- › **Depth of drill holes:** deeper holes generate more GHG emissions than shallow holes
- › **Number of holes**



Variables Affecting Energy Use

- 
- › Quality of Ground
 - › Water supply
 - › Model and drill condition
 - › Drill crew skill
 - › Waste management
 - Biodegradable, un-preserved wood, etc.
 - › Transport Distances
 - › Water treatment/recycling
 - › Energy supply source
 - › Energy jurisdiction

Case Studies

Annual drilling and GHG data at Nechalacho (Site 1) and East Kempville (Site 2) projects

	Annual metres drilled	GHG/metre	Diesel/metre	Maximum expenditure per year	Maximum GHG tonnes per year*	Carbon tax at \$50/t GHG per year
Site 1	4,960-27,665	0.046-0.055	13.8-19.7***	\$10 million	1,350	\$67,500
Site 2	984-3,110	0.015-0.027	4.34-5.67	\$1.3 million	94	\$4,700

*This includes all sources of GHG at site including camp, gasoline and aviation fuel, and diesel for heating, energy production and drilling.

Based on Nechalacho:

- › Need a 200,000 m drill program to exceed reporting threshold of 10,000 kt GHG
- › Need very high 1,000,000 m drill program to trigger Output Based Pricing

www.AvalonAdvancedMaterials.com

TSX: AVL
OTCQB: AVLNF



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Thor Lake, NWT



Goldcorp's Borden Mine: Embracing Change for an All-electric Mine of the Future

John Mullally, VP Government Affairs and Energy Regulation

March 3rd, 2019

Vision: Together, Creating Sustainable Value

BE SAFE



Safe Enough For Our Families

BE PRODUCTIVE



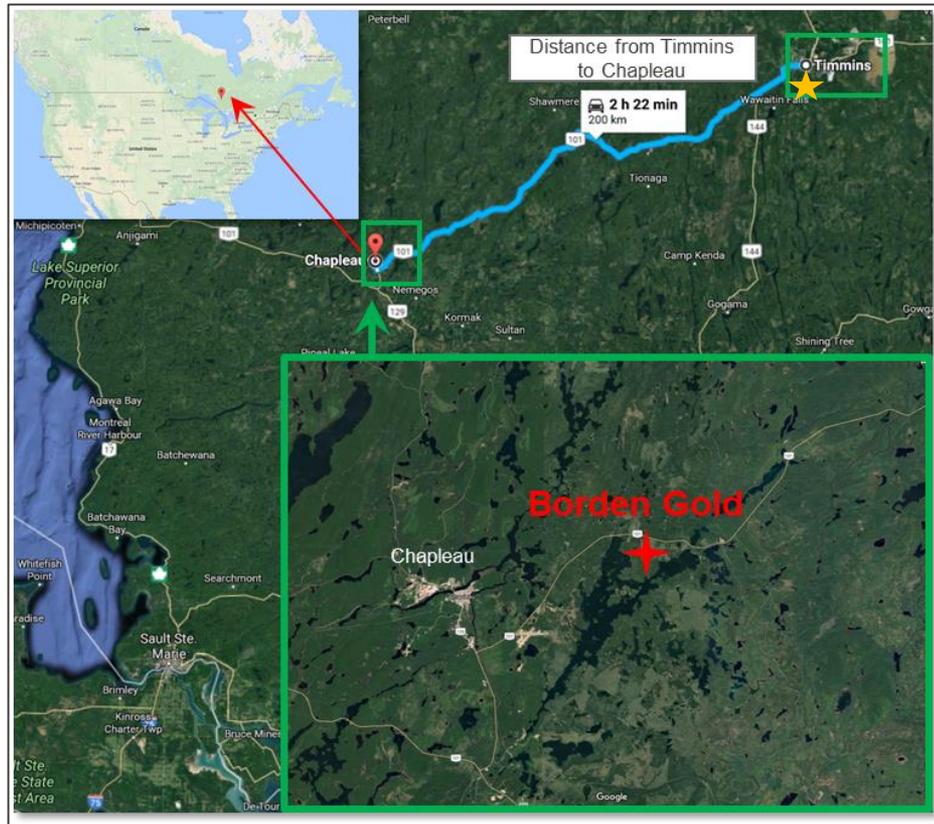
Deliver consistent and reliable financial and operational performance

BE RESPONSIBLE



Invest in the well-being of our people, our communities and our planet

Geographic Overview of Borden Site



★ Century Gold Project

The 100% owned Borden Project is located near Chapleau in Ontario

- Approximately 200 kilometers west of the Company's Porcupine mine

The underground mine expected is expected to produce approximately 2,000tpd

- To be hauled to Timmins and processed in our Porcupine milling facility

Borden: Executive Summary

Goldcorp's Borden Gold *'Mine of the Future'* project will be **the first underground mine in Canada** to replace all diesel mobile equipment with Electric Vehicles.

Partnering with like-minded suppliers, Government and First Nations to commercialize clean technologies, reduce GHG emissions, modernize the regulatory regime and improve the social acceptability of the industry.

The impact of this project will transform the industry and beyond.

- Strong environmental, health and safety, and economic co-benefits.
- Transitioning to a low carbon, modern economy that meets societal expectations.

Video: [Ditching Diesel](#)



Borden: 'Mine of the Future'

An All Electric Mine Is:

Safer. Quieter. No diesel underground, reduced risk of fires.

More environmentally friendly. Smaller carbon footprint, reduced risk of hydrocarbon spills, lower site footprint, reduced noise pollution.

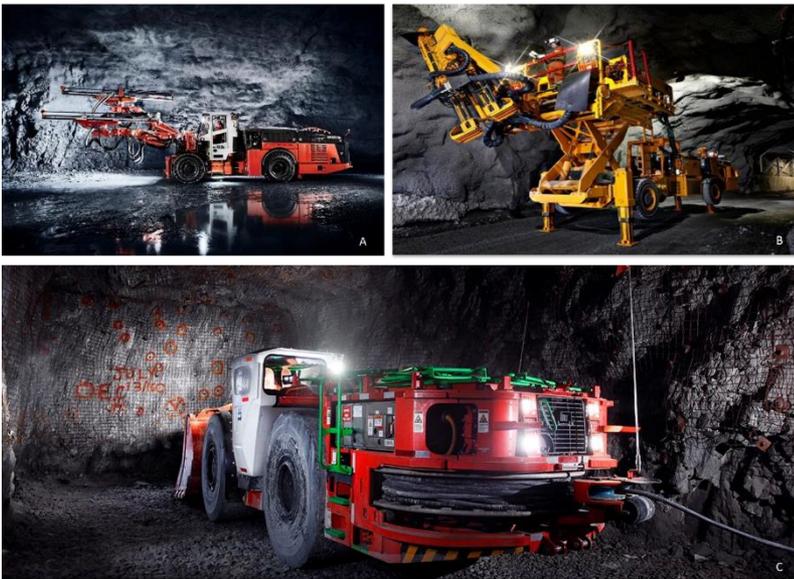
Better community partner. Smaller impact on the community improves relations. Reduction or elimination of exhaust fog in winter keeps the project out of sight.

More economic. When incorporated into the design, electric mine can be lower capital and lower operating cost mine.



Elevating Sustainability Performance Through Innovation

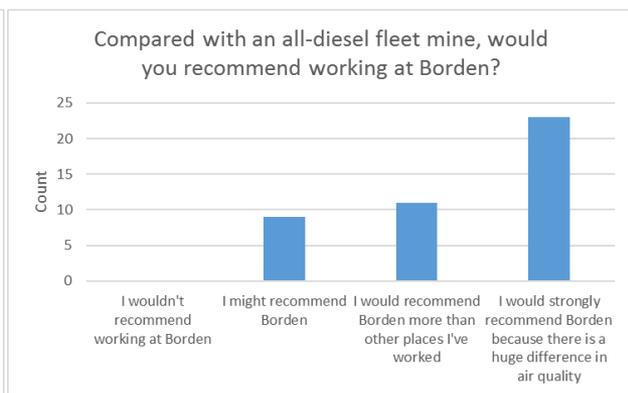
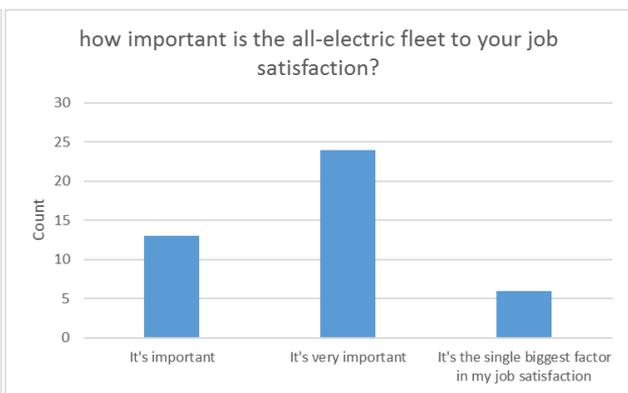
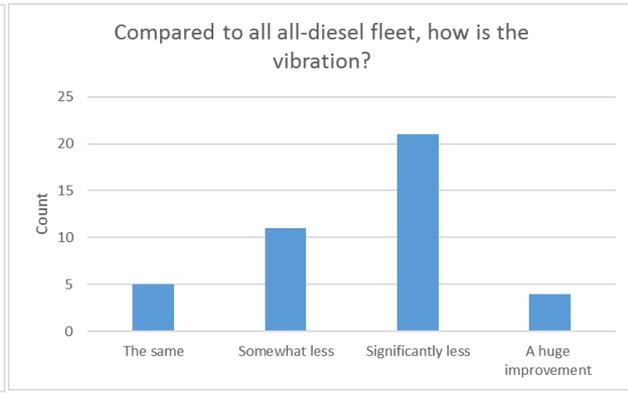
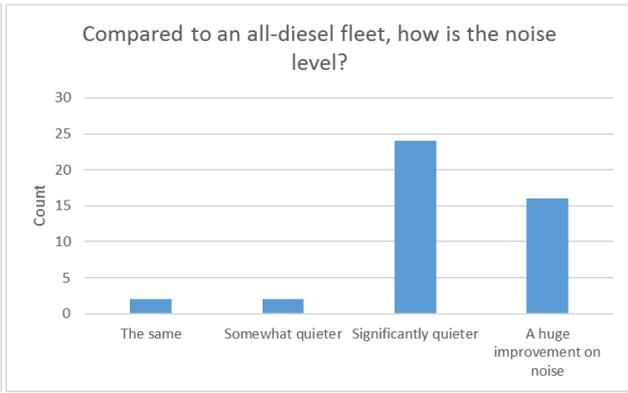
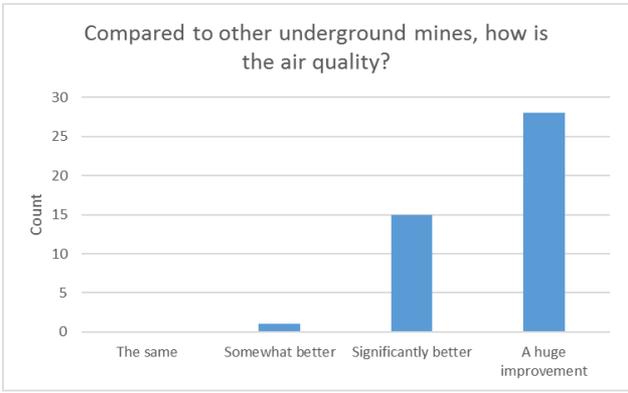
Borden: All-electric underground mine



Underground electrical equipment at Borden including; A. Battery/Electric Development Jumbo (Sandvik DD422IE) B. Battery/Electric Mechanized Bolter (McLean 975 Omnia Bolter) C. Fully Electric Scoop / Underground Loader (Sandvik LH514E)

- **Eliminate all greenhouse gases** associated with the movement of ore and waste rock.
- **Reduce annual GHG emission** by more than 7,000 tons or a 70% reduction over a baseline mine.
- Eliminate the use of approximately **2M litres of diesel** and over 1M litres of propane.
- Eliminate **33,000 MWh of energy** per year because of 50% reduction in ventilation requirements.
- Total OPEX savings of \$9 Million not including **health and safety benefits and productivity gains**

An All-electric Mine Considered a Better Place to Work with Significant Health and Safety Benefits



Note: Results of survey conducted of 44 miners at Borden

Q&A





MINING AND CLIMATE CHANGE RISK EXPOSURE FOR EXISTING OPERATIONS

PDAC
March 3, 2019

YAMANA**GOLD** | **15**
YEARS

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS: This presentation contains “forward-looking statements” within the meaning of the United States Private Securities Litigation Reform Act of 1995 and applicable Canadian securities legislation. Except for statements of historical fact relating to the Company, information contained herein constitutes forward-looking statements, including any information as to the Company’s strategy, plans or future financial or operating performance, the outcome of the legal matters involving the damages assessment and any related enforcement proceedings. Forward-looking statements are characterized by words such as “plan,” “expect,” “budget,” “target,” “project,” “intend,” “believe,” “anticipate,” “estimate” and other similar words, or statements that certain events or conditions “may” or “will” occur. Forward looking statements are based on the opinions, assumptions and estimates of management considered reasonable at the date the statements are made, and are inherently subject to a variety of risks and uncertainties and other known and unknown factors that could cause actual events or results to differ materially from those projected in the forward looking statements. These factors include the Company’s expectations in connection with the expected production and exploration, development and expansion plans at the Company’s projects discussed herein being met, the impact of proposed optimizations at the Company’s projects, the impact of the proposed new mining law in Brazil and the impact of general business and economic conditions, global liquidity and credit availability on the timing of cash flows and the values of assets and liabilities based on projected future conditions, fluctuating metal prices (such as gold, copper, silver and zinc), currency exchange rates (such as the Brazilian Real, the Chilean Peso, the Argentine Peso, and the Mexican Peso versus the United States Dollar), the impact of inflation, possible variations in ore grade or recovery rates, changes in the Company’s hedging program, changes in accounting policies, changes in mineral resources and mineral reserves, risk related to non-core asset dispositions, risks related to metal purchase agreements, risks related to acquisitions, changes in project parameters as plans continue to be refined, changes in project development, construction, production and commissioning time frames, risk related to joint venture operations, the possibility of project cost overruns or unanticipated costs and expenses, higher prices for fuel, steel, power, labour and other consumables contributing to higher costs and general risks of the mining industry, failure of plant, equipment or processes to operate as anticipated, unexpected changes in mine life, final pricing for concentrate sales, unanticipated results of future studies, seasonality and unanticipated weather changes, costs and timing of the development of new deposits, success of exploration activities, permitting time lines, government regulation and the risk of government expropriation or nationalization of mining operations, environmental risks, unanticipated reclamation expenses, title disputes or claims, limitations on insurance coverage and timing and possible outcome of pending litigation and labour disputes, as well as those risk factors discussed or referred to in the Company’s current and annual Management’s Discussion and Analysis and the Annual Information Form filed with the securities regulatory authorities in all provinces of Canada and available at www.sedar.com, and the Company’s Annual Report on Form 40-F filed with the United States Securities and Exchange Commission. Although the Company has attempted to identify important factors that could cause actual actions, events or results to differ materially from those described in forward-looking statements, there may be other factors that cause actions, events or results not to be anticipated, estimated or intended. There can be no assurance that forward-looking statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. The Company undertakes no obligation to update forward-looking statements if circumstances or management’s estimates, assumptions or opinions should change, except as required by applicable law. The reader is cautioned not to place undue reliance on forward-looking statements. The forward-looking information contained herein is presented for the purpose of assisting investors in understanding the Company’s expected financial and operational performance and results as at and for the periods ended on the dates presented in the Company’s plans and objectives and may not be appropriate for other purposes.

CAUTIONARY NOTE TO UNITED STATES INVESTORS CONCERNING ESTIMATES OF MEASURED, INDICATED AND INFERRED MINERAL RESOURCES This presentation uses the terms “Mineral Resource”, “Measured Mineral Resource”, “Indicated Mineral Resource” and “Inferred Mineral Resource” are defined in and required to be disclosed by National Instrument 43-101. However, these terms are not defined terms under Industry Guide 7 and are not permitted to be used in reports and registration statements of United States companies filed with the Commission. Investors are cautioned not to assume that any part or all of the mineral deposits in these categories will ever be converted into Mineral Reserves. “Inferred Mineral Resources” have a great amount of uncertainty as to their existence, and great uncertainty as to their economic and legal feasibility. It cannot be assumed that all or any part of an Inferred Mineral Resource will ever be upgraded to a higher category. Under Canadian rules, estimates of Inferred Mineral Resources may not form the basis of feasibility or pre-feasibility studies, except in rare cases. Investors are cautioned not to assume that all or any part of an Inferred Mineral Resource exists or is economically or legally mineable. Disclosure of “contained ounces” in a Mineral Resource is permitted disclosure under Canadian regulations. In contrast, the Commission only permits U.S. companies to report mineralization that does not constitute “Mineral Reserves” by Commission standards as in place tonnage and grade without reference to unit measures. Accordingly, information contained in this news release may not be comparable to similar information made public by U.S. companies subject to the reporting and disclosure requirements under the United States federal securities laws and the rules and regulations of the Commission thereunder.

The Company has included certain non-GAAP financial measures, which the Company believes that together with measures determined in accordance with IFRS, provide investors with an improved ability to evaluate the underlying performance of the Company. Non-GAAP financial measures do not have any standardized meaning prescribed under IFRS, and therefore they may not be comparable to similar measures employed by other companies. The data is intended to provide additional information and should not be considered in isolation or as a substitute for measures of performance prepared in accordance with IFRS. The non-GAAP financial measures included in this management discussion and analysis include: co-product cash costs per ounce of gold produced, co-product cash costs per ounce of silver produced, co-product cash costs per pound of copper produced, all-in sustaining co-product costs per ounce of gold produced, all-in sustaining co-product costs per ounce of silver produced, all-in sustaining co-product costs per pound of copper produced, adjusted earnings or loss, adjusted earnings or loss per share, adjusted operating cash flows, net debt, net free cash flow, and average realized price per ounce of gold sold, average realized price per ounce of silver sold, average realized price per pound of copper sold. Please refer to section 14 of the Company’s third quarter MD&A filed on SEDAR for a detailed discussion of the usefulness of the non-GAAP measures. The terms “EBITDA” and “EBITDA Margin” do not have a standardized meaning prescribed by IFRS, and therefore the Company’s definitions are unlikely to be comparable to similar measures presented by other companies. The Company believes that in addition to conventional measures prepared in accordance with IFRS, the Company and certain investors and analysts use this information to evaluate the Company’s performance. In particular, management uses these measures for internal valuation for the period and to assist with planning and forecasting of future operations. The presentation of EBITDA and EBITDA Margin is not meant to be a substitute for the information presented in accordance with IFRS, but rather should be evaluated in conjunction with such IFRS measures.

The information presented herein was approved by management of Yamana on February 16, 2017.

All amounts are expressed in United States dollars unless otherwise indicated.

OBJECTIVES AND DRIVERS

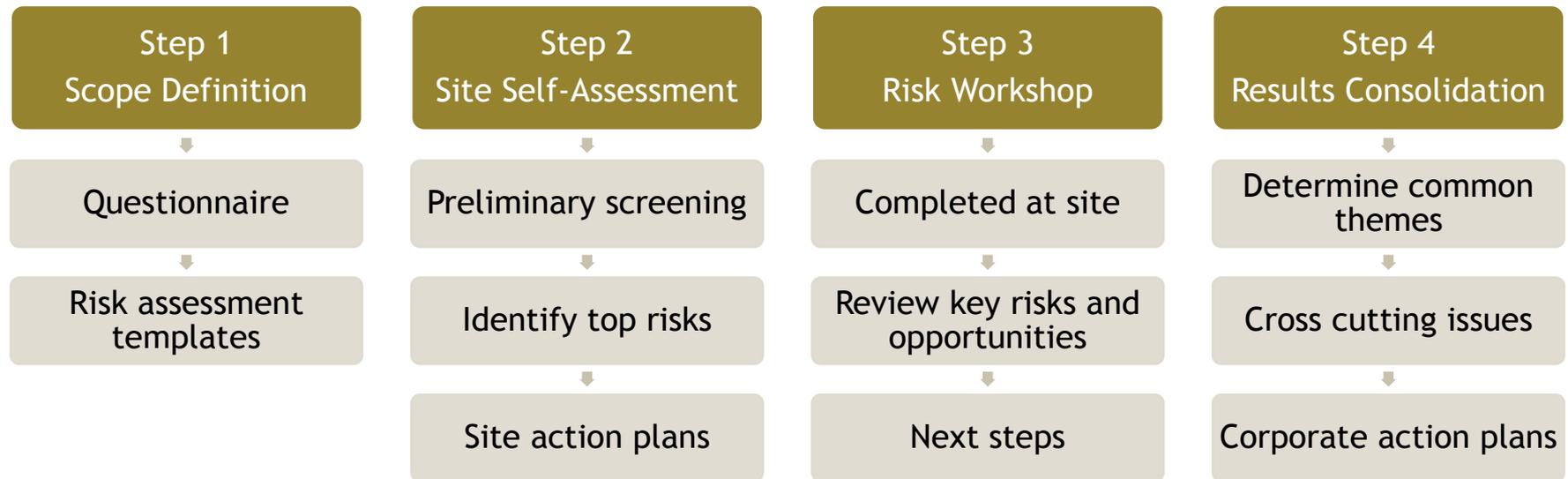
Objective for 2018:

Perform a risk assessment at our sites to better contextualize the full range of potential risks from climate change, water, and biodiversity.

- Key Drivers:
 - **Engage sites** in identifying and articulating key risks and opportunities
 - Evaluate and better understand our **level of preparedness** to mitigate the key risks
 - Categorize and **prioritize** potential risks to environment, community, operations, and reputation
 - Identify **common risk issues** and themes across Yamana sites
 - Determine potential areas for **future study** and consideration
 - Develop recommendations and work with operations on **action plans** to manage risks proactively

PROCESS

FOUR KEY STEPS



STEP 1: SCOPE DEFINITION

QUESTIONNAIRE

- Each risk assessment template included a questionnaire
- Purpose: better understand the current baseline conditions and context for each site

Questions included:

- Status of environmental and social baseline data
- Current climate trends
- Status of the site water balance
- Site vulnerabilities
- Regulatory context for climate change and water management
- Key stakeholders (government, community, NGO, etc.)

STEP 1: SCOPE DEFINITION

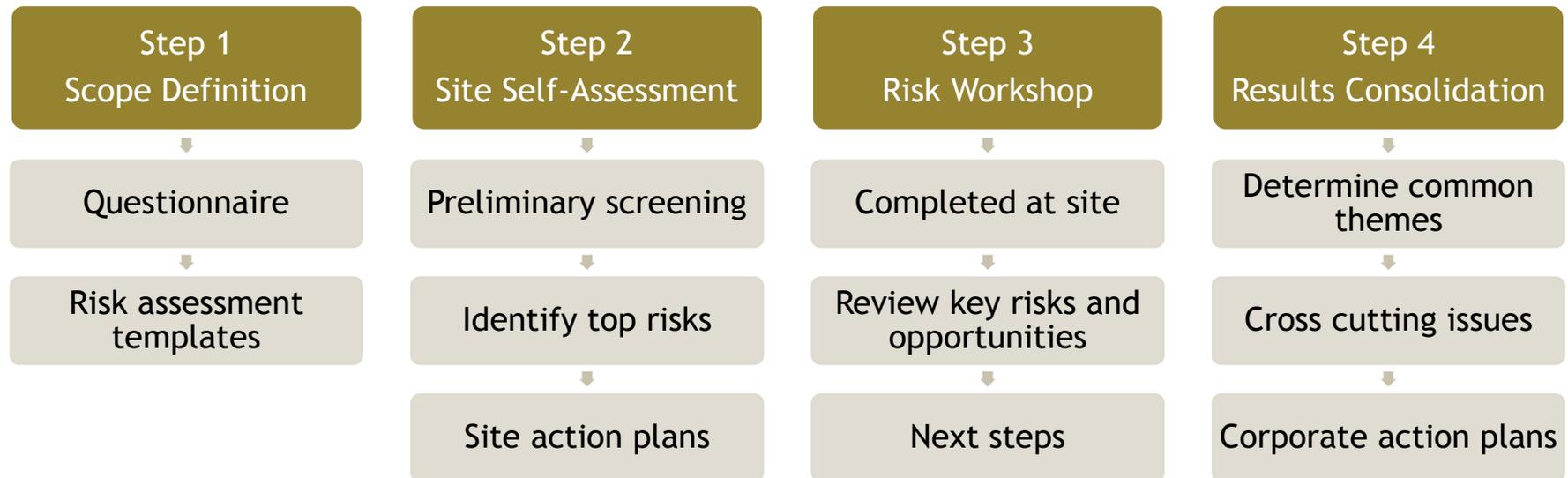
RISK ASSESSMENT TEMPLATES

Potential risks to each site were based on the following **climate** or climate-related variables and associated biophysical effects:

Variables	Effects
Increased Precipitation	Flooding, increased groundwater levels, increased surface water levels, soil erosion, storms events, increased surface water runoff, and landslide
Decreased Precipitation	Drought, water scarcity (seasonal and permanent), changes in water chemistry, fire, desertification, compromised hydropower assets
Increase in Temperature	Heat waves, increased average temperatures, increased evaporation / evapotranspiration, fire, desertification, disease (pests, pathogens)
Wind	Increased dust generation, soil contamination
Other	Stakeholder concerns (government, community, NGO) about biodiversity, climate change, water quality and water availability

PROCESS

FOUR KEY STEPS



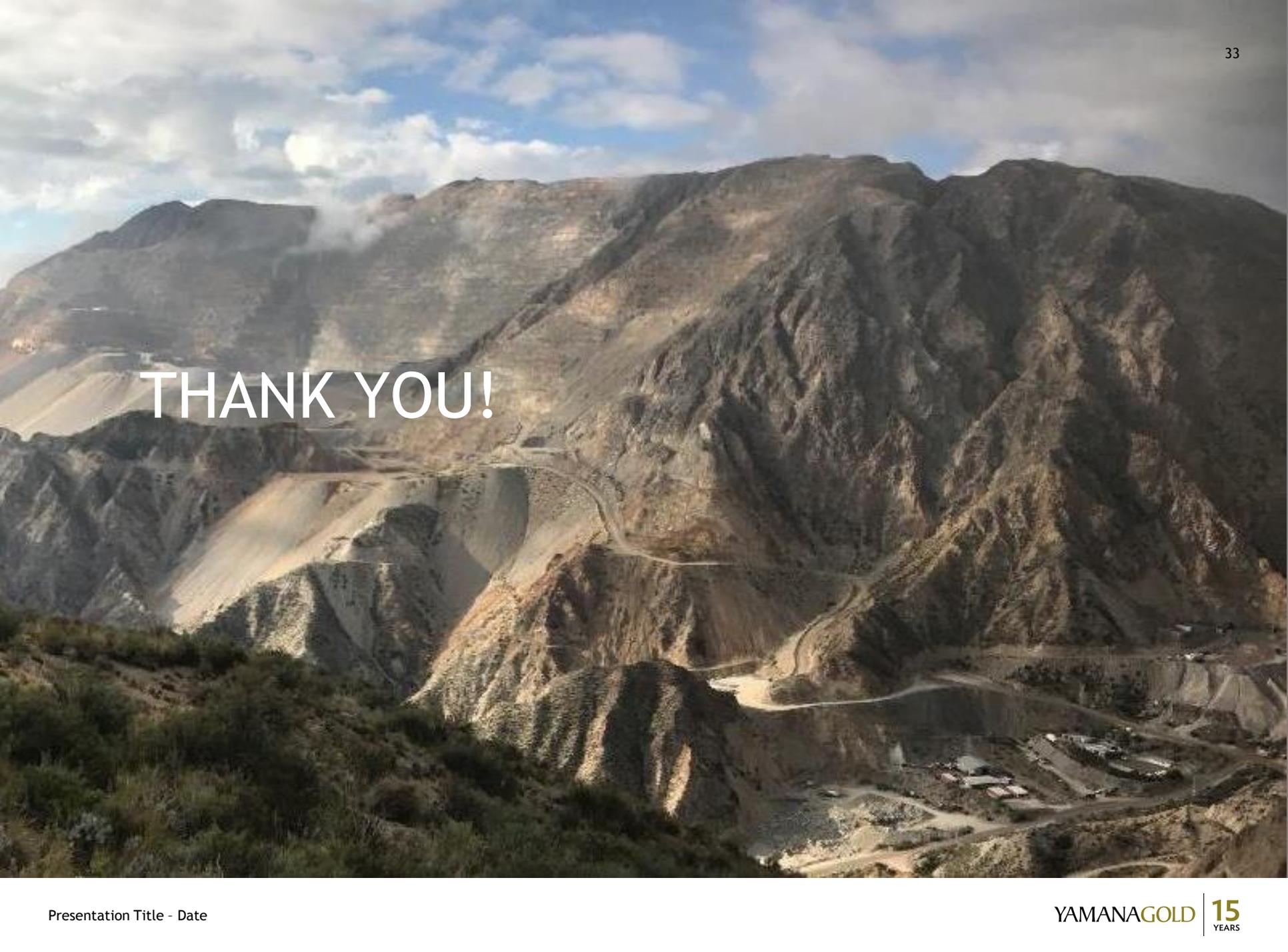
KEY OUTCOMES

- **Strengthening site water balance**
 - Preparedness for significant storm events (e.g. 1 in 500 year 24 hour)
 - Integration between departments (environment, community relations, mine)
 - Capacity building between sites
 - Tailings water management

- **Preparedness to deal with extreme events**
 - Insight into preparedness for each individual site and overall Yamana
 - Significant storm events
 - Flooding
 - Drought
 - Fire

PROCESS BENEFITS

- The process provided a number of benefits:
 - **Consistency** between sites by using a single framework for identifying, understanding, and responding to key risks
 - **Risk-based process** for identifying operational challenges
 - **Focused response** to managing and mitigating risks
 - **Proactive management** of our most critical risks
 - **Improved understanding and communication** to both internal and external stakeholders
 - **Cross learning** and capacity building at the site level
 - **Increased visibility** of environmental risks, including raising the profile with General Managers



THANK YOU!